Ambient Air Quality Monitoring
Opportunity and Warm Springs Sites
Fourth Quarter of 2009

Prepared for

Anaconda Deer Lodge County

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1.0 INTRODUCTION

This quarterly report documents the ambient air quality monitoring program conducted by Kuipers & Associates on behalf of Anaconda-Deer Lodge County (ADLC) at Opportunity and Warm Springs locations adjacent to the Atlantic Richfield Lower Waste Management Area. The months of October through December 2009 are included in this quarterly report, with a more detailed data summary in the monthly reports.

Objectives of this quarterly report include the following:

- Summarize the PM10 and Total Suspended Particulate (TSP) data on a quarterly basis and compare to applicable standards.
- Compare daily average TSP values recorded by the Opportunity Site against the PM10 values reported by the Atlantic Richfield Company's South Site.
- Present summarized meteorological data for the quarter.
- Present summarized results for ambient dust sampling conducted during the quarter.
- Present the Data Quality Summary (PM10, TSP and meteorological).
    - Review the hourly data according to the Environmental Protection Agency's Air Quality System Null Data Qualifier Codes.
    - Format hourly PM10 and TSP data for each month to fit the Environmental Protection Agency's Air Quality System raw data template.

Figure 1 shows the ADLC monitoring locations in Opportunity and Warm Springs, and the Atlantic Richfield Company’s South Site monitoring location.


ADLC Warm Springs PM10
ARCO North PM10
ADLC Opportunity TSP
ARCO South PM10
Feet
0 625 1,250 2,500 3,750 5,000
N
Water & Environmental Technologies
Anaconda Deer Lodge County
Air Quality Monitoring points
Figure 1

2.0 PM10 AND TSP DATA SUMMARY

The Met One E-BAM portable PM10 monitor at Warm Springs and the TSP monitor at Opportunity collected continuous hourly data at both locations from October 1 through December 31.

During the period of operation, data recovery was 97.1% at Opportunity and 97.3% at Warm Springs. Detailed ambient air quality monitoring results for the fourth quarter of 2009 are summarized in the October, November, and December monthly reports prepared by Kuipers & Associates. A general discussion of ambient air quality monitoring data from the fourth quarter of 2009 is provided in the following sections. All PM10 and TSP data are reported at Local temperature and pressure (LTP) conditions.

2.1 Opportunity Site

At the Opportunity location daily average TSP concentrations ranged from 1 $\mu g/m^3$ to 55 $\mu g/m^3$ with an average of 8 $\mu g/m^3$ throughout the fourth quarter. The maximum daily average TSP reading of 55 $\mu g/m^3$ was observed on December 6. Strong north winds were present during the highest concentrations observed on that day, indicating that the LWMA was a likely particulate source. Interestingly, the ARCO South PM10 monitor reported a daily average concentration of only 2 $\mu g/m^3$ on December 6. This indicates that nearly all of the airborne particulate was larger than 10 microns, which is consistent with strong winds blowing from the LWMA. There is considerable hourly variability on many days; on average the maximum daily one-hour concentration was 27 $\mu g/m^3$ in October, 41 $\mu g/m^3$ in November and 43 $\mu g/m^3$ in December. Daily average TSP concentrations for the quarter are presented in Figure 2 for the Opportunity monitoring site, and also in Appendix A.

Currently, there is no ambient air quality standard for TSP. However, all daily average TSP results for the fourth quarter of 2009 at Opportunity were well below the historical 24-hour Montana Ambient Air Quality Standard of 200 $\mu g/m^3$. The maximum observed daily average of 55 $\mu g/m^3$ was only 27.5% of that historical standard.

No Opportunity TSP data from the fourth quarter was rejected or omitted for quality assurance or quality control check results. Minor data losses occurred due to maintenance activities, power outages, and brief periods of extreme cold (temperatures <-30°C). Additionally, 30 hours of TSP data were excluded from analysis because of suspicion that the readings were affected by snow events.

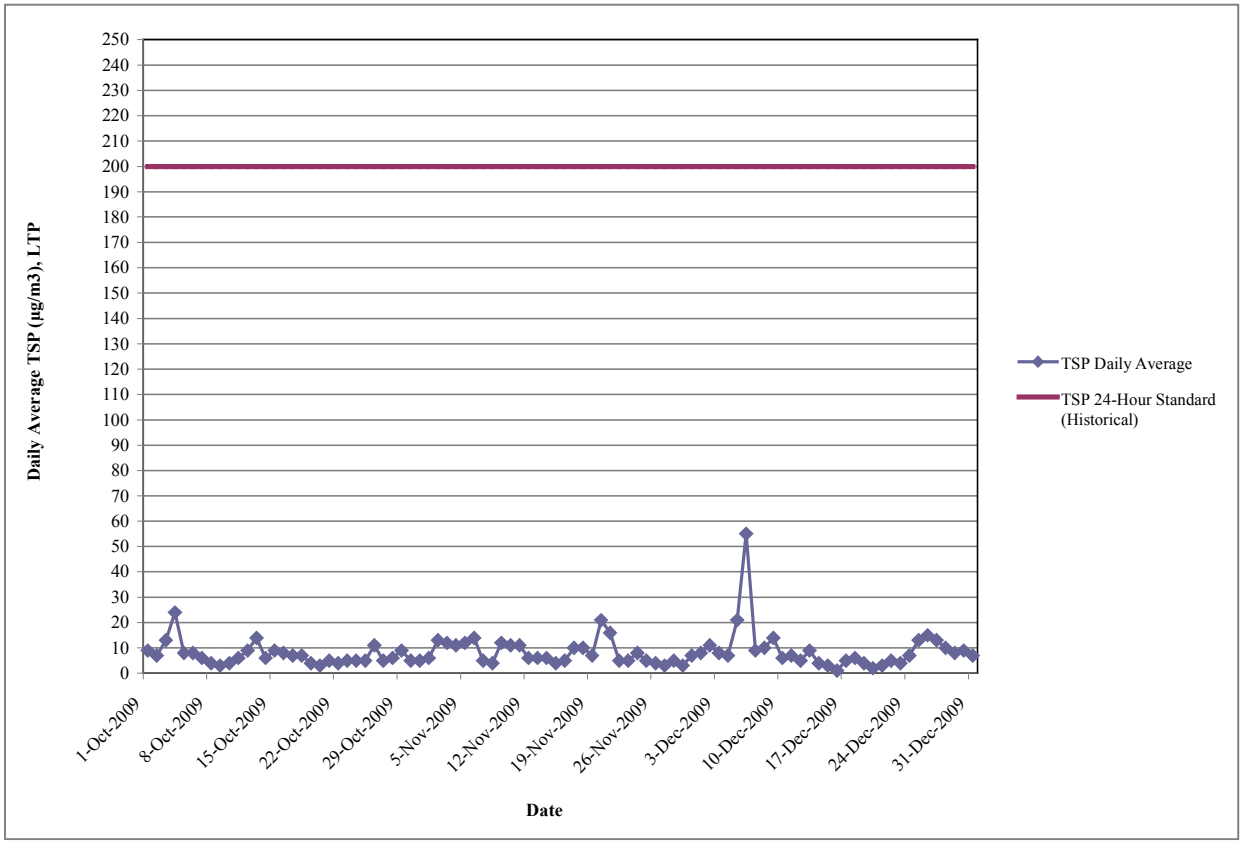

FIGURE 2 – OPPORTUNITY SITE DAILY AVERAGE TSP CONCENTRATION

2.2 Warm Springs Site

At the Warm Springs location daily average PM10 concentrations ranged from non-detectable to 12 µg/m^3 with a quarterly average of 4 µg/m^3. The maximum daily average PM10 reading of 12 µg/m^3 was observed on December 28. The highest hourly concentrations on December 28 were accompanied by nearly calm winds and cold temperatures, suggesting regional air stagnation. There is considerable hourly variability on many days; on average the maximum daily one-hour concentration was 18 µg/m^3 in October, 20 µg/m^3 in November, and 21 µg/m^3 in December. Daily PM10 average concentrations for the fourth quarter are presented in Figure 3 for the Warm Springs monitoring site, and also in Appendix A.

All daily average PM10 results for the fourth quarter of 2009 at Warm Springs were well below the 24-hour Montana Ambient Air Quality Standard of 150 µg/m^3. No Warm Springs PM10 data from the fourth quarter was rejected or omitted for quality assurance or quality control reasons. Minor data losses occurred due to maintenance activities, power outages, and periods of extreme cold (temperatures <-30°C). Additionally, 14 hours of PM10 data were excluded from analysis because of suspicion that the readings were affected by snow events.

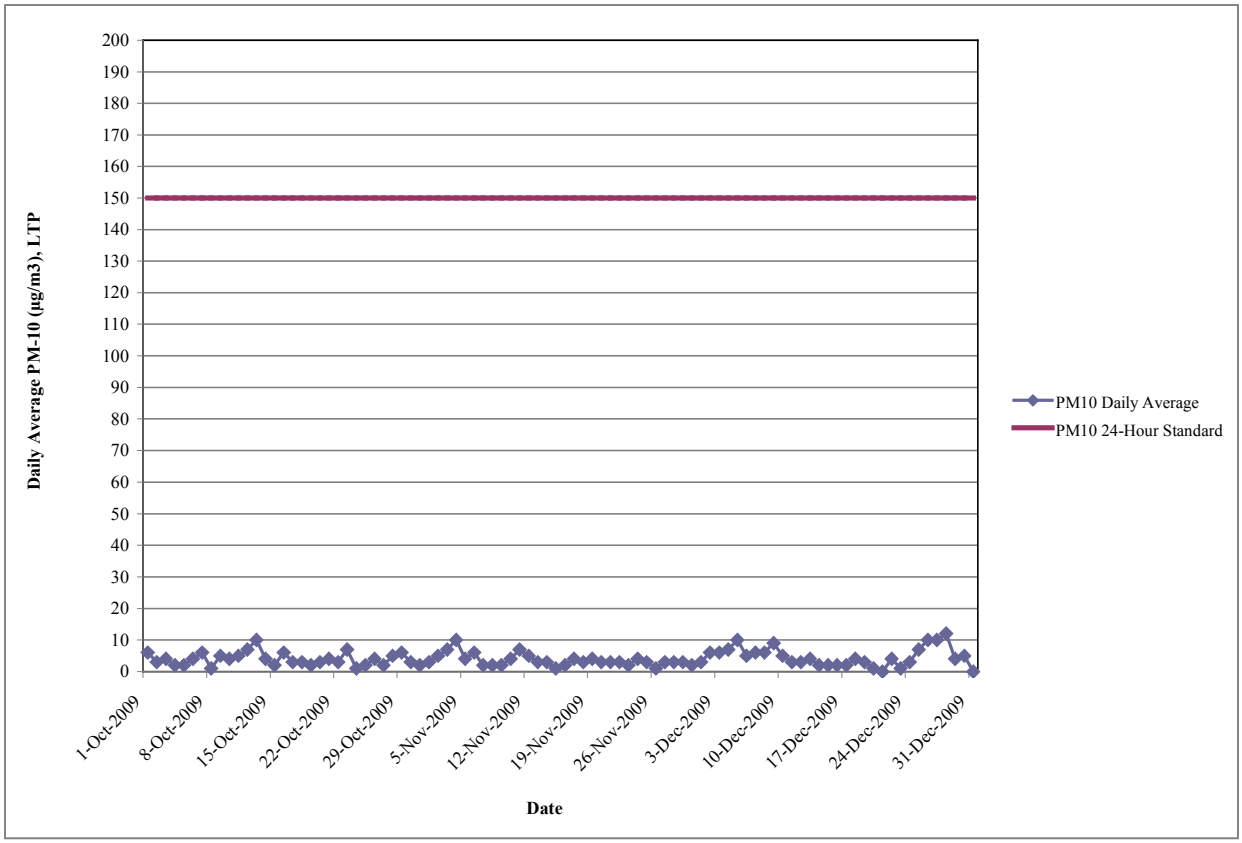

FIGURE 3 – WARM SPRINGS SITE DAILY AVERAGE PM10 CONCENTRATION

3.0 COLLOCATED PARTICULATE MONITORING RESULTS COMPARISON

Daily average (24-hour) results from the ADLC E-BAM TSP monitor at the Opportunity site were compared to the Atlantic Richfield Wedding PM10 monitors at the South Site for the quarter. The ADLC monitor collects screening level data, while the Atlantic Richfield monitors follow a federal reference method (FRM) required for compliance with air quality standards. While these are different measurements, collocated PM10 data collected at Opportunity from May 2007 through June 2008 indicated good general agreement between the E-BAM and Wedding PM10 monitoring systems. Therefore, a comparison of the Opportunity E-BAM TSP data versus Wedding PM10 data should provide an indication of the ratio of total airborne particulate to the inhalable fraction (PM10).

The individual collocated results are listed in Table 1, and depicted graphically in Figure 4. While the ratio shows high day-to-day variability – particularly at lower concentrations – on average the total amount of airborne particulate (TSP) was approximately 4 times the amount of inhalable particulate (PM10) on a total mass ration basis. This is higher than the ratios observed during previous quarters, which were usually between 2:1 and 3:1. However, the ratio was greatly affected by the data from December 6, when a daily TSP value of 55 $\mu g/m^3$ was observed for the ADLC monitor, compared to only 2 $\mu g/m^3$ for the ARCO South PM10 monitor. Strong north winds occurred for much of the day, which is consistent with entrainment of large dust particles from the LWMA. If the data from December 6 are excluded, the TSP/PM10 ratio

decreases to 3.31:1, which is not greatly different from previous quarters. Both TSP and PM10 readings at Opportunity were generally lower than those observed during the same quarter in 2008.

The diagonal line on Figure 4 represents a best-fit linear regression of TSP against daily average PM10 values. The data point for December 6 (PM10 value of 2 and TSP value of 55) is clearly at variance with the general pattern of other data points for the quarter.

TABLE 1 – COLLOCATED RESULTS FOR TSP VS. PM10
DAILY AVERAGE VALUES
FOURTH QUARTER 2009
(All values are $\mu g/m^3$ at Local temperature and pressure (LTP))

Date	Standard ARCO - PM-10 Wedding FRM South Site	Test ADLC - TSP Met One E-BAM Opportunity Site	TSP as Percent of PM-10	TSP as Percent of PM-10 Cumulative
October 1, 2009	6	9	150	150
October 4, 2009	3	24	800	367
October 7, 2009	1	6	600	390
October 10, 2009	2	4	200	358
October 16, 2009	4	8	200	319
October 19, 2009	4	4	100	275
October 22, 2009	3	4	133	257
October 25, 2009	4	5	125	237
October 28, 2009	5	6	120	219
October 31, 2009	2	5	250	221
November 3, 2009	6	12	200	218
November 6, 2009	2	14	700	240
November 9, 2009	3	12	400	251
November 12, 2009	3	6	200	248
November 15, 2009	0	4	N/A	256
November 18, 2009	1	10	1000	271
November 21, 2009	0	16	N/A	304
November 23, 2009	1	5	500	308
November 27, 2009	1	3	300	308
November 30, 2009	1	7	700	315
December 3, 2009	2	8	400	319
December 6, 2009	2	55	2750	405
December 9, 2009	4	14	350	402
December 12, 2009	0	5	N/A	410
December 15, 2009	1	3	300	408
December 18, 2009	1	6	600	411
December 21, 2009	0	3	N/A	416
December 24, 2009	1	7	700	421
December 27, 2009	6	13	217	403
December 30, 2009	3	9	300	**399**

Mean	473
Maximum	2750
Minimum	100

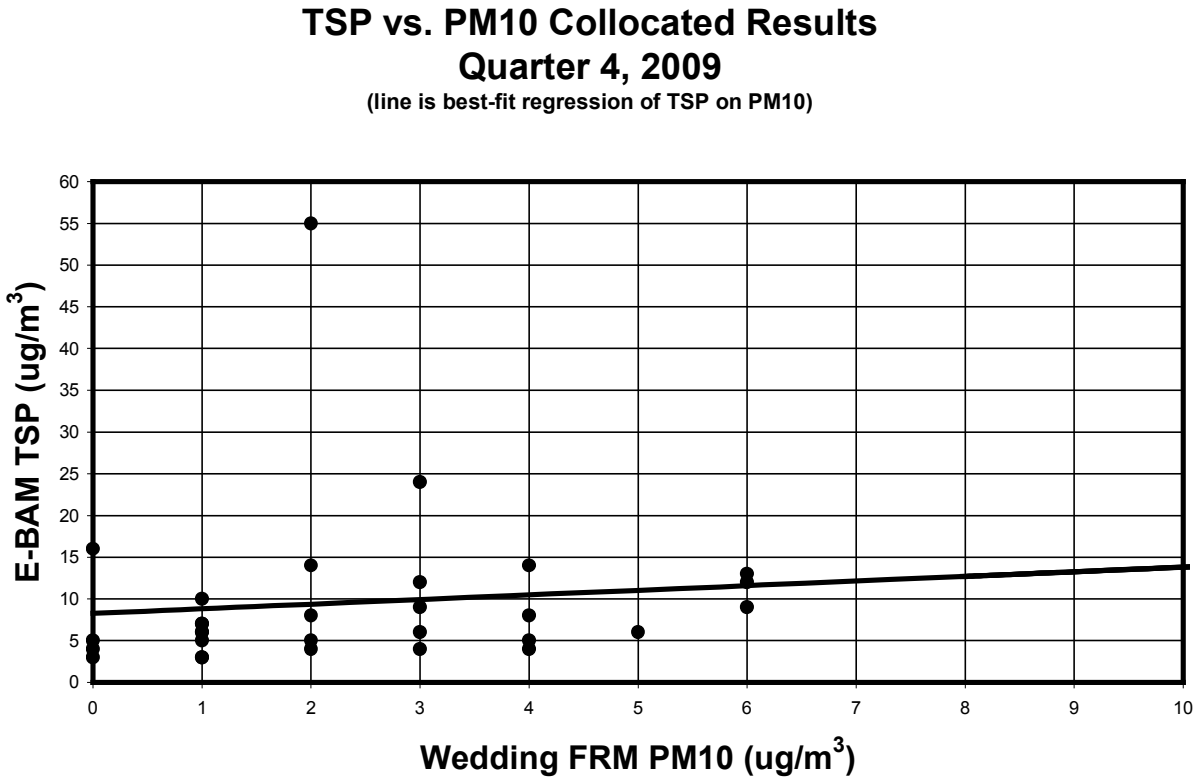

FIGURE 4 – COLLOCATED RESULTS COMPARISON FOR ADLC OPPORTUNITY E-BAM (TSP) AND ATLANTIC RICHFIELD WEDDING FRM (PM10)

4.0 DUST MONITORING RESULTS

Starting August 15, 2008, clean 9-inch diameter glass dishes were set out at both sites at a height of approximately 7 feet to capture and retain settling dust. A personal sampling pump supplied by SKC, Inc. was used to vacuum any settled dust from the dishes during twice-weekly site visits. Vacuuming could not be performed when standing water was present. In those instances, the water was allowed to evaporate, and vacuuming was performed at the next opportunity.

The vacuumed dust was collected onto 37-mm diameter, matched weight mixed cellulose ester (MCE) filter cassettes and submitted for analysis. The samples were analyzed for arsenic, cadmium, copper, lead and zinc, as well as total dust weight.

Settled dust samples were collected at both sites during the fourth quarter of 2009. Results are summarized in Table 2. A memorandum discussing the collection and analysis of the dust samples is presented in Appendix B, including any data quality concerns. The laboratory analytical report is presented in Attachment 1.

Additional sampling using dustfall jars was implemented in October 2008, and samples were collected during the fourth quarter of 2009. Those results also are summarized in Table 2.

Selected exposed filters from the ARCO South samplers at Opportunity are analyzed for arsenic and lead concentrations, in addition to PM10. Average concentrations of arsenic and lead for the ARCO samples were calculated for calendar year 2009 on a total mass basis for all days with PM10 concentrations of 10 $\mu g/m^3$ or more, with a result of 108 mg/kg for arsenic and 220 mg/kg for lead. Although the sampling methods are much different, and the ARCO samplers collect only PM10 (rather than total particulate), the arsenic concentrations found in the Opportunity settled dust samples and dustfall jar samples were only slightly higher than those calculated for the ARCO air samples. The lead concentrations found in the Opportunity samples are somewhat lower than the corresponding ARCO result, but still of similar magnitude.

The arsenic and lead concentrations for the Warm Springs samples were generally similar magnitude to those observed at Opportunity.

TABLE 2 – SUMMARY OF DUST MONITORING RESULTS

A. Opportunity Site *(All values mg/kg)*

Analyte	9/18/09 – 11/9/09	11/9/09 – 1/1/10		
	Settled Dust	Settled Dust	Dustfall-A	Dustfall-B
As	140	99.1	146	127
Cd	4.27	3.17	17.0	13.0
Cu	528	451	449	669
Pb	137	108	91.6	102
Zn	610	553	960	774
Dustfall Rate	N/A	N/A	0.24g/m^2/month (1)	0.33g/m^2/month (1)
(1) Based on 30-day month				

B. Warm Springs Site *(All values mg/kg)*

Analyte	9/18/09 – 11/9/09	11/9/09 – 1/1/10	
	Settled Dust	Settled Dust	Dustfall
As	78.5	131	101
Cd	2.97	3.89	20.0
Cu	324	686	530
Pb	83.1	109	88.0
Zn	391	754	932
Dustfall Rate	N/A	N/A	0.25g/m^2/month (1)
(1) Based on 30-day month			

5.0 METEOROLOGICAL DATA SUMMARY

Meteorological data were collected continuously and recorded hourly at both the Opportunity and Warm Springs E-BAM monitoring sites. Parameters monitored include wind direction, wind speed, temperature and relative humidity. The data were collected at a height of approximately eight feet above ground level.

Summarized meteorological data for these sites are presented and discussed in Sections 5.1 and 5.2. Detailed daily meteorological summaries are presented in Appendix A, including:

- Average, maximum and minimum air (shade) temperature for each day,
- Average and maximum hourly average wind speed for each day,
- Resultant wind direction for each day (weighted by wind speed – this is the mean direction from which the wind was blowing),
- Average daily relative humidity, and
- Total daily precipitation (Opportunity) – beginning in December 2009.

Additionally, the summaries in Appendix A show the average daily and maximum daily PM10 and TSP concentrations, to facilitate correlation with the meteorological data.

Section 5.3 presents wind rose summaries for periods with elevated PM10 and TSP levels.

5.1 Opportunity Site

Figure 5 summarizes the meteorological data for the Opportunity site. Winds were generally light, averaging 2.2 m/s (4.9 mph). The highest recorded hourly wind speed was 7.1 m/s (15.9 mph); it is likely that higher short-term gusts have occurred, but the system only monitors hourly average wind speed. Temperatures were well below normal in October, above normal in November and below normal in December. Monthly averages were 2.3°C (36.1°F) in October, 0.6°C (33.1°F) in November and –8.9°C (16.0°F) in December. Temperature extremes ranged from a low of less than –30.0°C (-22.0°F) in December to a high of 22.0°C (71.6°F) in October. The average humidity for the quarter was 62%, with considerable daily variation. On December 4, an automated, heated tipping-bucket rain gauge was installed at the Opportunity site to provide local precipitation data, and to help identify periods when TSP readings (and PM10 readings at Warm Springs) may have been affected by precipitation episodes. The total measured precipitation for December (including melted snow) was only 0.02 inches.

Winds at the Opportunity site were mostly from the south-southeast through southwest, though northerly winds also were fairly common. The strongest winds tended to be from the south-southeast, southwest and north.

Minor meteorological data losses occurred due to routine maintenance and short power outages, but none occurred due to data quality issues. Additionally, 68 hours of wind direction data were lost in October because an allen screw worked loose, causing the vane tail to fall off.

Part 1 – Means and Extremes

Parameter	October	November	December	Quarter
Average Wind Speed, m/s	2.3	2.3	2.0	2.2
Maximum (hourly) Wind Speed, m/s	6.9	6.5	7.1	7.1
Average Temperature, °C	2.3	0.6	-8.9	-2.0
Maximum Temperature, °C	22.0	16.7	7.5	22.0
Minimum Temperature, °C	-16.9	-16.0	<-30.0	<-30.0
Average Relative Humidity, %	65	57	65	62
Total Precipitation, inches	N/A	N/A	0.02	Incomplete
Refer to Appendix A for detailed daily meteorological summaries.				

Part 2 – Quarter 4, 2009 Wind Rose

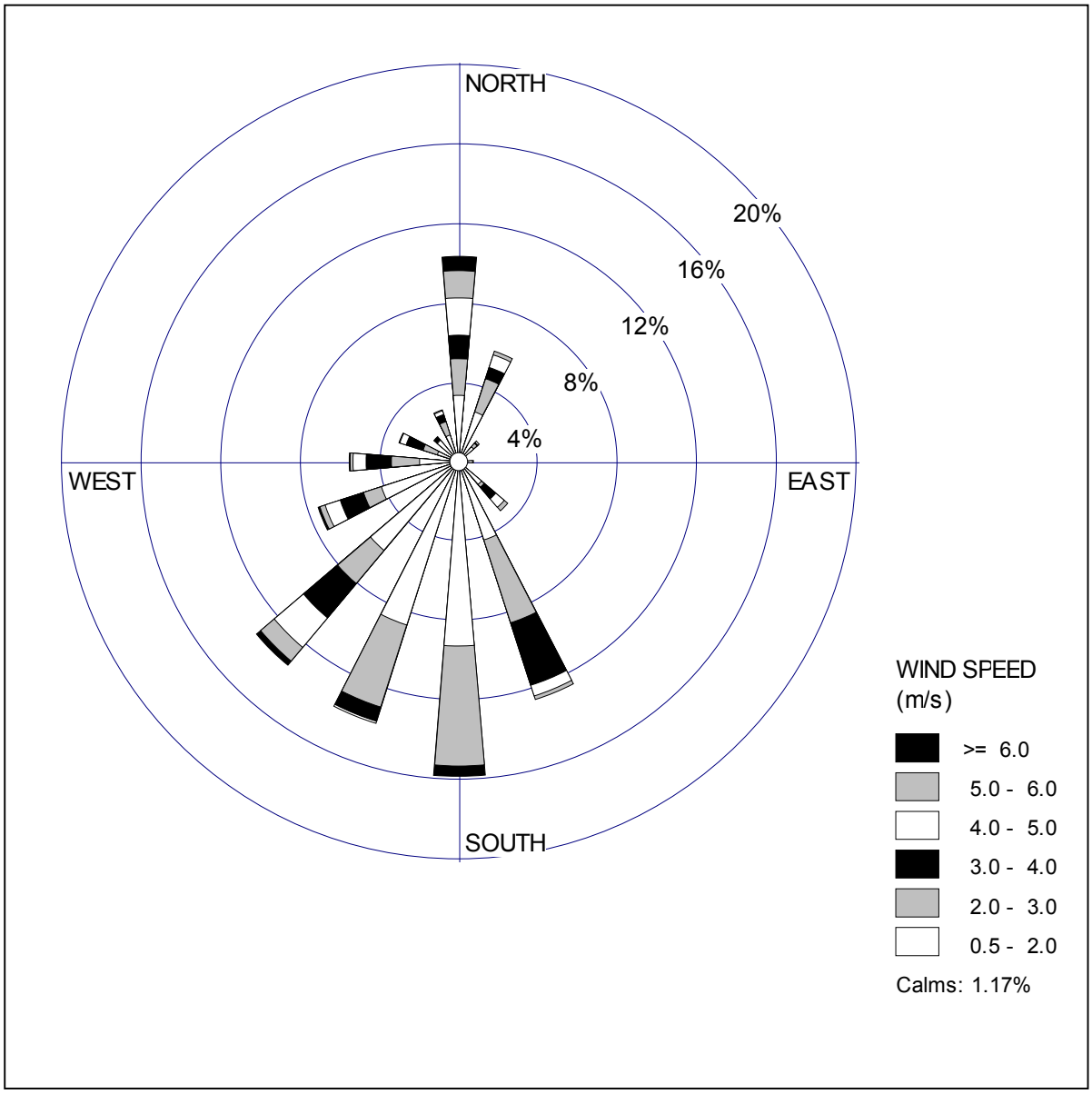

FIGURE 5 – METEOROLOGICAL SUMMARY FOR OPPORTUNITY SITE

5.2 Warm Springs Site

Figure 6 summarizes the meteorological data for the Warm Springs site. Winds were generally light, averaging 2.1 m/s (4.7 mph). The highest recorded hourly wind speed was 7.8 m/s (17.4 mph); it is likely that higher short-term gusts have occurred, but the system only monitors hourly average wind speed. Temperatures were well below normal in October, above normal in November and below normal in December. Monthly averages were 2.8°C (37.0°F) in October, 1.2°C (34.2°F) in November and –9.5°C (14.9°F) in December. Temperature extremes ranged from a low of less than –30.0°C (-22.0°F) in December to a high of 22.9°C (73.2°F) in October. The average humidity for the quarter was 64%, with considerable daily variation.

Winds at the Warm Springs site were mostly from southerly directions, though northerly winds also were common. The strongest winds were mostly from southerly and westerly directions.

Minor meteorological data losses occurred due to routine maintenance and short power outages, but none occurred due to data quality issues. A total of 459 hours of relative humidity data were lost from late October through early November because of a faulty signal cable connection that required sending the relative humidity sensor to the manufacturer for repair. However, the relative humidity data for the Opportunity site should be reasonably representative during that period.

Part 1 – Means and Extremes

Parameter	October	November	December	Quarter
Average Wind Speed, m/s	2.1	2.4	1.8	2.1
Maximum (hourly) Wind Speed, m/s	6.4	7.8	5.6	7.8
Average Temperature, °C	2.8	1.2	-9.5	-1.9
Maximum Temperature, °C	22.9	18.3	8.9	22.9
Minimum Temperature, °C	-15.8	-16.0	<-30.0	<-30.0
Average Relative Humidity, %	67	57	66	64
Refer to Appendix A for detailed daily meteorological summaries.				

Part 2 – Quarter 4, 2009 Wind Rose

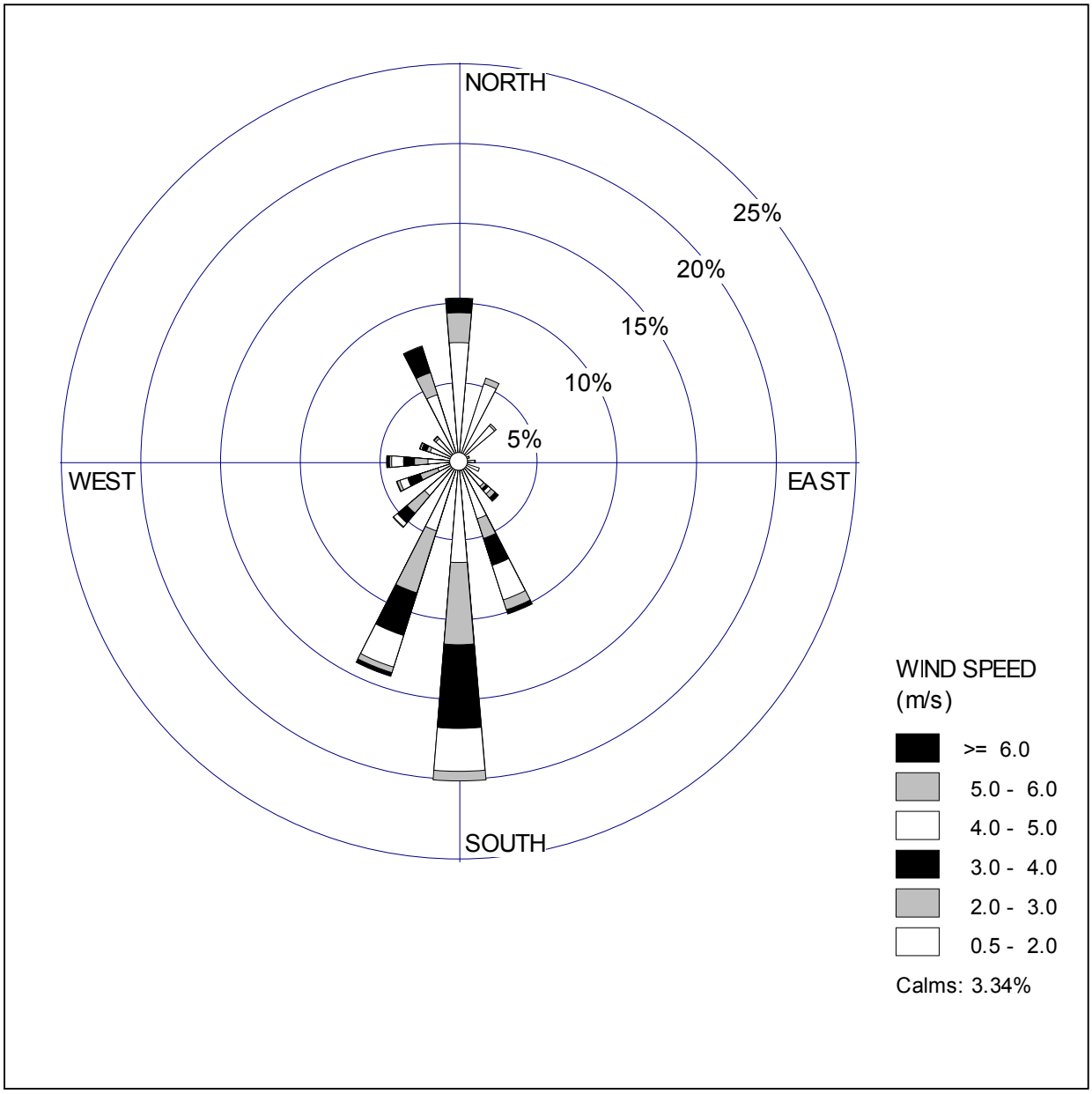

FIGURE 6 – METEOROLOGICAL SUMMARY FOR WARM SPRINGS SITE

5.3 Meteorological Conditions and Particulate Concentrations

Additional wind roses were generated for both monitoring sites to depict wind patterns during periods of elevated particulate concentrations – with the Opportunity site shown in Figure 7 and the Warm Springs site shown in Figure 8. For this analysis, "elevated" was defined as TSP concentrations greater than or equal to 25 $\mu g/m^3$ at Opportunity, and PM10 concentrations of greater than or equal to 15 $\mu g/m^3$ at Warm Springs. These thresholds – corresponding to roughly the 95th percentile at both sites– were used to ensure that a sufficient volume of data was incorporated to produce meaningful wind rose results.

When comparing the wind roses for the Opportunity site (Figures 5 and 7), it is evident that wind speeds were often higher during elevated TSP conditions. This is reasonable, since the larger – and therefore heavier – particulates collected by a TSP monitor would require greater wind activity to be entrained into the air. The wind direction distribution during elevated TSP periods was also notably different from the overall pattern, with north winds being very pronounced. This indicates potential impacts from the LWMA, though it should be noted that all measured TSP concentrations at the Opportunity site were well below the historical TSP standard.

The corresponding wind roses for the Warm Springs site (Figures 6 and 8) show that winds were not greatly different during elevated PM10 periods. Wind speeds during elevated PM10 periods were actually somewhat lower than during other times, suggesting air stagnation as a more important factor than the LWMA.

These results suggest that TSP levels at Opportunity are influenced by the Opportunity tailings area during strong north winds, but that elevated PM10 levels at Warm Springs are not associated with winds blowing from the tailings area.

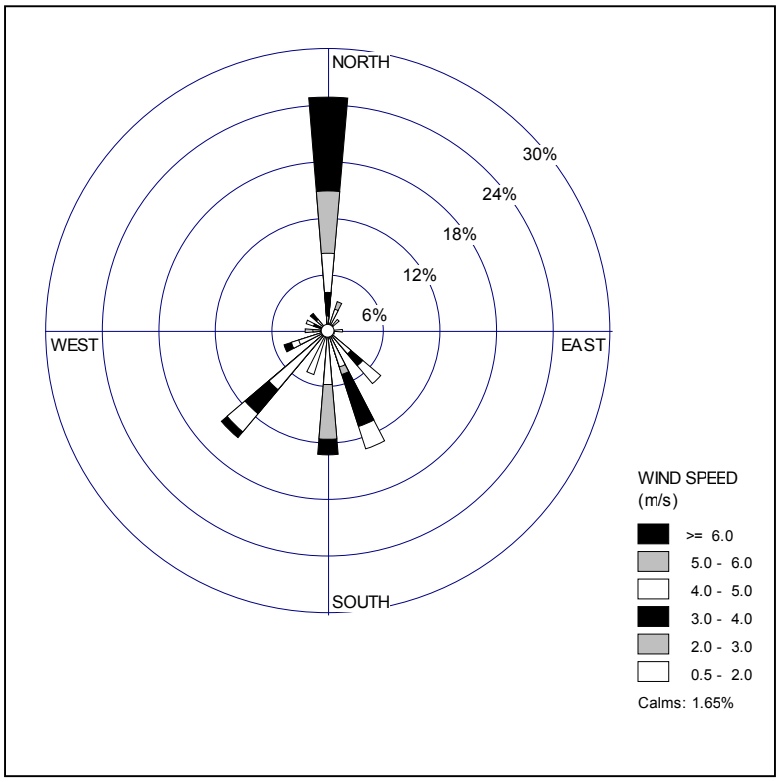

FIGURE 7 – OPPORTUNITY WIND ROSE FOR ELEVATED TSP PERIODS

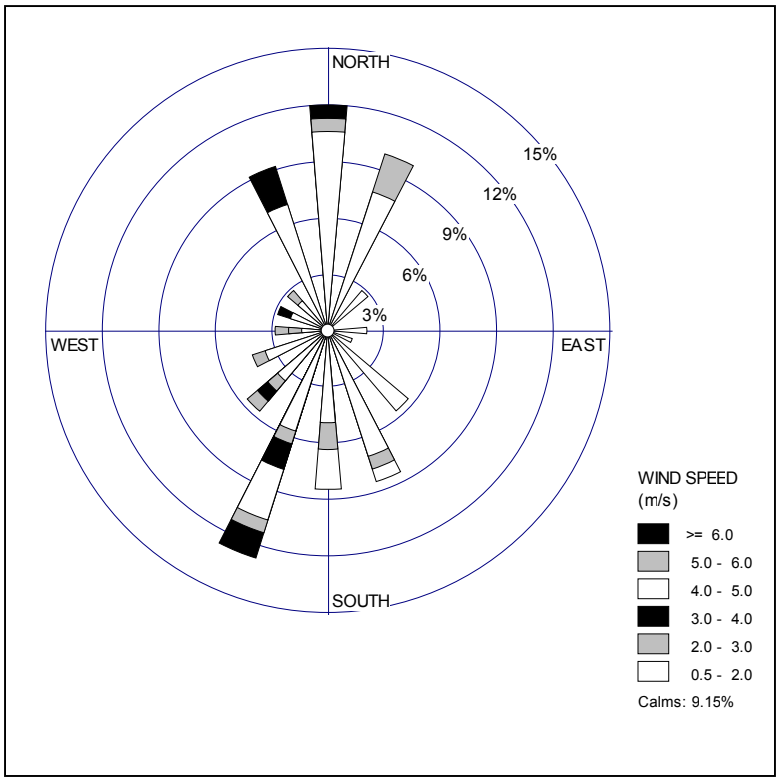

FIGURE 8 – WARM SPRINGS WIND ROSE FOR ELEVATED PM10 PERIODS

6.0 DATA QUALITY SUMMARY

Data quality is an integral part of any ambient monitoring program. The data collected must be of a known quality to be used for evaluation of local air quality and meteorological characteristics. This is particularly important when an objective of a monitoring program is to identify possible emission sources, and meteorological events associated with certain ambient air quality conditions – in this case, elevated PM10 or TSP levels.

The Opportunity and Warm Springs monitoring systems were checked and/or calibrated (as appropriate for each monitoring parameter) monthly during the fourth quarter of 2009. This was accomplished via performance checks using standards that were either:

- Traceable to NIST; or
- Otherwise certified by the test equipment manufacturer.

Each instrument response was recorded, and evaluated to determine whether it fell within its respective acceptance range. In the event that a response fell outside (or near the limits of) the applicable acceptance range, the monitor or sensor in question was adjusted or recalibrated as appropriate. Such results then must be evaluated, in conjunction with a detailed data review, to identify data periods that must be flagged or invalidated.

Minor sampler maintenance was also performed on a monthly basis. Additionally, data were reviewed frequently via satellite link, and inspected for any suspicious behavior requiring investigation.

6.1 Summary of Performance Check / Maintenance Activities

Performance checks and minor maintenance were conducted on a monthly basis. Table 3 summarizes checks and maintenance for the E-BAM sampler itself, while Table 4 lists the meteorological checks. Information presented includes:

- The instrument model and serial number for each component of the monitoring system;
- Each type of check/maintenance performed on that component;
- Performance acceptance ranges; and
- A description of the calibration standard (and its traceability) used to perform each check.

6.2 Data Quality Issues

In general, performance checks and maintenance activities conducted throughout the fourth quarter of 2009 indicted that the E-BAM samplers were meeting performance objectives. The performance check procedures and routine maintenance activities are discussed in detail in Appendix C. Results for the fourth quarter of 2009 are presented in Appendix D. All E-BAM sampler test results obtained during the fourth quarter of 2009 were satisfactory.

Causes of data losses during the fourth quarter included the following:

- A total of 68 hours of wind direction data at Opportunity were lost because an allen screw worked loose on the vane assembly, causing the vane tail to fall off.
- A total of 459 hours of relative humidity data at Warm Springs were lost between late October and mid-November because of a faulty cable connection that required sending the relative humidity unit to the manufacturer for repair.
- Additional data losses occurred during the fourth quarter of 2009 because ambient temperatures fell below -30°C for several periods in December. When this occurs, the particulate samplers stop operating, and the temperature and humidity data become unreliable (however, the wind monitors continue to collect data). This resulted in the loss of particulate, temperature and humidity data for 24 hours at Opportunity, and 34 hours at Warm Springs. During these periods, the temperature values are set to -30°C for data analysis purposes.
- A total of 30 hours of TSP data at Opportunity, and 14 hours of PM10 data at Warm Springs, were invalidated because of suspicion that the readings were affected by snow events.
- Short instrument icing episodes resulted in the loss of 6 hours of wind data at the Opportunity site, and 45 hours at the Warm Springs site.
- Additional minor data losses occurred at both sites due to routine maintenance and short power outages.

TABLE 3 – SUMMARY OF PERFORMANCE CHECKS E-BAM SAMPLER

Met One E-BAM PM_{10} and TSP Samplers

Instrument	Model	Serial No.		Check Description			
		OPP	*WS*	*Check Description*	*Acceptance Range*	*Check/Cal. Standard*	*Traceability*
Particulate Sampler	E-BAM	F7290 (TSP)	F7289 (PM_{10})	Leak Check	<1.5 LPM	BX-302 valve	N/A
				Operating Flow	+/- 2% (+/- 0.33 LPM)	Delta Cal S/N 000498	MFR/NIST
				Pump Test	Discontinued because of unreliability		
				Zero/Span	Pass / Fail	Membrane Plates	MFR
				Clean Vane & Nozzle	(2)	N/A	N/A
				Clean PM10 Head	N/A	N/A	N/A
Barometer (3)	E-BAM	F7290	F7289	Collocated	+/- 2 mmHg	Aneroid Barometer	Mercury Barometer

Explanatory Notes for Table 3

N/A = Not applicable
MFR/NIST = Certified traceable to NIST by the manufacturer
MFR = Certified accurate per Met One's E-BAM-6100 Final Test Procedure
(1) Acceptance range varies with test flow rate, see Appendix C for discussion.
(2) Leak check performed following cleaning, result must be <1.5 LPM.
(3) Barometer is internal to E-BAM sampler.

TABLE 4 – SUMMARY OF PERFORMANCE CHECKS METEOROLOGICAL INSTRUMENTS

Met One Meteorological Instruments

Instrument (1)	Model	Serial No.		Check Description			
		OPP	*WS*	*Check Description*	*Acceptance Range*	*Check/Cal. Standard*	*Traceability*
Temperature	9250	F9487	F9481	Collocated	+/- 0.5 °C	Assmann Psychrometer	NIST
Relative Humidity	593	F9346	F9349	Collocated	+/- 5% Relative Humidity	Assmann Psychrometer	NIST
Wind Speed	0348	G2181	G2187	Collocated	+/- 0.5 m/s	Met One 010 Sensor	NIST
				Rotation Check	+/- 0.2 m/s	Synchronous Motor	MFR
Wind Direction	0348	G2181	G2187	Initial Alignment	+/- 2 degrees	Solar Sighting	NIST Time
				Linearity	+/- 3 degrees	Visual Crossarm Alignment (2)	N/A

Explanatory Notes for Table 4

(1) All meteorological instruments include certificate of NIST traceability from Met One, valid for a period of one year.
(2) Linearity checked by visually aligning wind vane in 90-degree increments with respect to crossarm.

MFR = Motor rotation rate provided by manufacturer.

7.0 AIR QUALITY SYSTEM NULL DATA QUALIFIER CODES

Invalid hours for the quarter are summarized in Table 5 for the Opportunity site, and Table 6 for the Warm Springs site. The complete PM10 and TSP data sets for the quarter, and current qualifier codes are presented in Appendix E.

TABLE 5 – OPPORTUNITY SITE INVALID DATA PERIODS QUARTER 4, 2009

Part A – TSP

Date	Invalid Hours (ending at) MST	Invalid Hours GMT	Reason	Data Invalidation Code
10-7-2009	1000-1600	1700-2300	Suspect snow effects	AM
10-8-2009	2200-2300		Suspect snow effects	AM
10-9-2009	0000-1200	0500-1900	Suspect snow effects	AM
10-16-2009	1300	2000	Tape change	BA
10-30-2009	1600-1700	2300	Monthly checks	BA
10-31-2009		0000	Monthly checks	BA
11-12-2009	0000, 1300	0700, 2000	Suspect snow effects	AM
11-13-2009	1600	2300	Adjusted filter tape	BA
11-23-2009	1300	2000	Tape change	BA
11-27-2009	1100, 1200	1800, 1900	Pump change	BA
11-30-2009	1600	2300	Monthly checks	BA
12-1-2009	0500-1000	1200-1700	Suspect snow effects	AM
12-7-2009	0600-1000	1300-1700	Ambient temp <-30ºC	AO
12-7-2009	2000-2300		Ambient temp <-30ºC	AO
12-8-2009	0000-1000	0300-1700	Ambient temp <-30ºC	AO
12-8-2009	2000-2300		Ambient temp <-30ºC	AO
12-9-2009		0300-0600	Ambient temp <-30ºC	AO
12-24-2009	1500	2200	Monthly checks	BA

Part B – Wind Direction / Wind Speed

Date	Invalid Hours (ending at) MST	Invalid Hours GMT	Reason	Data Invalidation Code
10-21-2009	0300-0800	1000-1500	Instrument icing	AO
10-25-2009	0000-2300	0200-2300	Tail came off vane	AM (1)
10-26-2009	0000-2300	0000-2300	Tail came off vane	AM (1)
10-27-2009	0000-1400	0000-2100	Tail came off vane	AM (1)
10-30-2009	1600	2300	Monthly checks	BA
11-27-2009	1100	1800	Pump change	BA
11-30-2009	1600	2300	Monthly checks	BA
12-28-2009	1600	2300	Monthly checks	BA
(1) Only wind direction was invalid for these periods.				

Part C – Temperature / Relative Humidity

Date	Invalid Hours (ending at) MST	Invalid Hours GMT	Reason	Data Invalidation Code
11-27-2009	1100	1800	Pump change	BA
12-7-2009	0600-1000	1300-1700	Ambient temp <-30ºC	AO
12-7-2009	2000-2300		Ambient temp <-30ºC	AO
12-8-2009	0000-1000	0300-1700	Ambient temp <-30ºC	AO
12-8-2009	2000-2300		Ambient temp <-30ºC	AO
12-9-2009		0300-0600	Ambient temp <-30ºC	AO
Note: Relative humidity values invalidated with AO code. Temperature values were set to -30ºC for averaging purposes.				

TABLE 6 – WARM SPRINGS SITE INVALID DATA PERIODS QUARTER 4, 2009

Part A – PM10

Date	Invalid Hours (ending at) MST	Invalid Hours GMT	Reason	Data Invalidation Code
10-8-2009	2200-2300		Suspect snow effects	AM
10-9-2009	0000-0900	0500-1600	Suspect snow effects	AM
10-10-2009	1700		Spurious reading	AM
10-11-2009		0000	Spurious reading	AM
10-16-2009	1200	1900	Tape change	BA
10-30-2009	1400-1500	2100-2200	Monthly checks	BA
11-23-2009	1400	2100	Tape change	BA
11-27-2009	1200-1300	1900-2000	Pump change	BA
11-30-2009	1500	2200	Monthly checks	BA
12-1-2009	0900-1000	1600-1700	Suspect snow effects	AM
12-7-2009	0100	0800	Power outage	AV
12-7-2009	0500-1000	1200-1700	Ambient temp <-30ºC	AO
12-7-2009	1600	2300	Adjusted temperature	BA
12-7-2009	1900-2300		Ambient temp <-30ºC	AO
12-8-2009	0000-1000	0200-1700	Ambient temp <-30ºC	AO
12-8-2009	1900-2300		Ambient temp <-30ºC	AO
12-9-2009	0000-0600	0200-1300	Ambient temp <-30ºC	AO
12-11-2009	1600	2300	Adjusted temperature	BA
12-24-2009	1400	2100	Monthly checks	BA

Part B – Wind Direction / Wind Speed

Date	Invalid Hours (ending at) MST	Invalid Hours GMT	Reason	Data Invalidation Code
10-7-2009	1900-2300		Instrument icing	AO
10-8-2009	0000-1000	0200-1700	Instrument icing	AO
10-19-2009	2200-2300		Instrument icing	AO
10-20-2009	0000-1000	0500-1700	Instrument icing	AO
10-25-2009	0200-0700	0900-1400	Instrument icing	AO
10-30-2009	1400	2100	Monthly checks	BA
11-12-2009	0200-1100	0900-1800	Instrument icing	AM
11-27-2009	1200	1900	Pump change	BA
11-30-2009	1500	2200	Monthly checks	BA
12-7-2009	0100	0800	Power outage	AV
12-28-2009	1500	2200	Monthly checks	BA

Part C – Temperature / Relative Humidity

Date	Invalid Hours (ending at) MST	Invalid Hours GMT	Reason	Data Invalidation Code
10-25-2009	1300-2300	2000-2300	Faulty RH cable	AN (1)
10-26-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
10-27-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
10-28-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
10-29-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
10-30-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
10-31-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-1-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-2-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-3-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-4-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-5-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-6-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-7-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-8-2009	0000-2300	0000-0700	Faulty RH cable	AN (1)
11-9-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-10-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-11-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-12-2009	0000-2300	0000-2300	Faulty RH cable	AN (1)
11-13-2009	0000-1500	0000-2200	Faulty RH cable	AN (1)
12-7-2009	0100	0800	Power outage	AV
12-7-2009	0500-1000	1200-1700	Ambient temp <-30ºC	AO (2)
12-7-2009	1900-2300		Ambient temp <-30ºC	AO (2)
12-8-2009	0000-1000	0200-1700	Ambient temp <-30ºC	AO (2)
12-8-2009	1900-2300		Ambient temp <-30ºC	AO (2)
12-9-2009	0000-0600	0200-1300	Ambient temp <-30ºC	AO (2)

Note:
(1) Relative humidity data only.
(2) Relative humidity values invalidated with AO code. Temperature values were set to –30ºC for averaging purposes.

8.0 REFERENCES

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APPENDIX A

MONTHLY DATA SUMMARIES
FOURTH QUARTER 2009

OPPORTUNITY DAILY DATA SUMMARY - OCTOBER 2009

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	9	22	2.7	4.0	269	3.2	6.7	-0.3	55
2	7	27	1.7	3.5	210	4.1	10.6	-2.3	57
3	13	45	2.9	6.9	15	3.1	10.4	-4.0	65
4	24	103	5.2	6.4	8	1.3	1.9	0.0	70
5	8	28	3.7	5.6	6	0.3	4.4	-3.6	70
6	8	42	2.6	5.5	247	4.2	12.3	-4.2	53
7	6	18	2.4	4.6	351	0.2	5.0	-2.5	74
8	4	25	2.3	4.8	288	-1.2	5.7	-9.4	66
9	3	12	2.9	4.8	354	-9.4	-6.5	-13.0	69
10	4	15	1.3	2.2	3	-9.3	-4.9	-12.1	66
11	6	27	1.2	2.4	3	-9.6	-4.2	-15.5	66
12	9	23	1.6	3.3	176	-6.1	2.7	-16.9	65
13	14	30	2.9	4.9	152	4.1	11.7	-3.0	58
14	6	24	2.7	5.2	213	8.6	13.7	4.8	62
15	9	36	1.8	5.1	293	5.5	11.0	-1.2	70
16	8	29	1.4	2.8	196	6.7	18.0	-2.2	67
17	7	18	2.4	3.5	180	12.8	22.0	6.0	47
18	7	24	1.7	3.2	336	9.1	13.2	1.8	63
19	4	18	0.9	2.8	357	3.5	5.0	1.4	87
20	3	13	0.9	1.8	3	3.5	7.2	0.3	84
21	5	20	2.7	5.0	221	4.5	9.1	-0.5	71
22	4	20	2.0	4.1	272	5.9	11.1	-0.9	63
23	5	19	2.8	6.2	224	4.9	9.9	-1.4	68
24	5	13	3.1	6.9	275	4.5	7.3	0.9	53
25	5	24	1.3	2.4	NO DATA	1.7	7.7	-3.6	55
26	11	32	3.7	5.6	NO DATA	6.9	10.8	2.5	51
27	5	16	2.5	3.9	4	-0.4	1.8	-2.7	65
28	6	19	1.6	2.9	335	-1.9	0.7	-4.6	77
29	9	41	2.2	4.3	229	-2.7	1.3	-8.8	66
30	5	23	2.4	4.5	260	5.0	10.9	-2.2	70
31	5	26	3.5	6.2	228	8.2	13.2	3.4	59

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

OPPORTUNITY DAILY DATA SUMMARY - NOVEMBER 2009

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	6	22	2.6	4.9	346	3.2	7.0	-5.5	60
2	13	56	1.6	3.2	191	-0.8	8.7	-7.7	62
3	12	26	1.7	3.8	312	1.0	8.1	-4.1	58
4	11	44	1.8	3.0	201	5.0	16.2	-3.8	43
5	12	38	2.4	4.0	195	8.7	16.7	2.5	38
6	14	98	3.4	6.5	251	5.9	10.5	-0.4	50
7	5	23	2.0	5.5	232	1.1	7.5	-4.5	60
8	4	38	2.8	5.6	232	1.3	6.8	-2.9	52
9	12	48	2.0	4.9	171	1.2	9.7	-5.3	46
10	11	31	2.0	4.7	212	3.0	10.2	-6.6	47
11	11	37	1.8	4.0	190	1.0	4.9	-6.0	76
12	6	30	1.3	3.1	12	-4.6	-1.5	-12.8	85
13	6	16	1.9	3.3	174	-8.2	-1.0	-16.0	66
14	6	29	1.4	2.9	157	-6.9	-2.5	-14.1	69
15	4	27	2.2	3.7	178	-5.3	1.4	-12.0	54
16	5	21	4.2	5.8	152	1.3	5.3	-3.3	56
17	10	44	2.6	5.8	163	4.7	11.5	0.1	43
18	10	72	1.8	4.8	358	-1.7	1.7	-8.7	69
19	7	34	2.7	4.2	173	0.0	6.4	-8.6	56
20	21	61	2.9	4.4	152	3.7	7.8	0.4	40
21	16	240	3.2	5.5	252	-1.3	3.8	-5.1	54
22	5	19	2.4	3.6	176	-3.7	-0.6	-7.4	61
23	5	27	2.4	4.5	237	-1.2	1.7	-4.6	58
24	8	22	2.2	5.0	200	-0.3	4.1	-3.8	64
25	5	23	2.0	3.3	186	2.2	9.2	-4.4	66
26	4	20	2.6	3.6	184	5.4	11.0	2.1	47
27	3	18	2.1	3.5	135	2.4	8.7	0.4	65
28	5	17	1.5	3.0	356	-2.0	1.8	-7.2	66
29	3	25	2.5	4.6	240	1.4	5.0	-3.3	61
30	7	27	2.8	5.9	201	2.1	7.1	-3.4	54

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

OPPORTUNITY DAILY DATA SUMMARY - DECEMBER 2009

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	(c) Average Temperature (deg C)	Maximum Temperature (deg C)	(c) Minimum Temperature (deg C)	Average Relative Humidity (percent)	Total Precip. (inches)
1	8	42	2.5	4.8	343	-7.8	2.5	-18.4	69	NO DATA
2	11	40	0.9	1.7	194	-17.6	-8.7	-23.6	69	NO DATA
3	8	28	1.1	2.4	166	-18.7	-11.2	-22.4	69	NO DATA
4	7	29	1.9	3.4	240	-10.0	-3.5	-18.5	59	0.00
5	21	77	3.0	5.7	3	-11.5	-9.5	-14.7	74	0.00
6	55	368	5.5	7.1	1	-19.1	-15.1	-22.6	59	0.00
7	9	34	1.0	2.7	149	-25.9	-18.2	-30.0	56	0.00
8	10	32	0.7	1.3	173	-27.2	-19.6	-30.0	54	0.00
9	14	49	1.1	2.6	99	-24.1	-19.0	-28.4	64	0.00
10	6	26	1.9	6.4	189	-15.7	-8.2	-25.5	52	0.00
11	7	22	2.7	4.8	193	-6.4	-1.9	-9.6	37	0.00
12	5	25	2.3	4.7	204	-3.5	0.6	-7.7	58	0.00
13	9	51	1.6	3.1	13	-9.1	-1.6	-12.9	75	0.02
14	4	18	2.1	4.5	246	-4.9	-1.6	-9.2	62	0.00
15	3	14	3.0	3.9	170	0.1	2.9	-2.8	61	0.00
16	1	16	3.1	5.2	202	2.7	5.0	1.0	64	0.00
17	5	29	2.1	4.8	234	0.0	4.6	-6.8	74	0.00
18	6	17	1.6	2.9	176	-4.7	-1.5	-7.9	76	0.00
19	4	14	3.0	6.2	209	0.9	4.1	-3.6	67	0.00
20	2	14	2.7	5.9	194	4.4	6.2	3.4	68	0.00
21	3	25	2.4	4.2	190	3.5	7.5	-1.1	63	0.00
22	5	28	1.5	2.9	333	-0.9	0.8	-2.0	74	0.00
23	4	19	2.8	4.2	319	-4.5	-2.3	-8.9	62	0.00
24	7	57	1.5	3.4	285	-10.4	-7.3	-16.3	63	0.00
25	13	34	0.8	1.6	249	-11.4	-6.6	-16.1	76	0.00
26	15	54	0.7	1.9	286	-14.0	-6.0	-18.7	73	0.00
27	13	48	1.0	2.2	225	-13.5	-3.6	-19.4	71	0.00
28	10	33	1.4	2.9	202	-9.6	-0.8	-18.0	64	0.00
29	8	27	1.5	2.7	193	-7.2	-0.4	-11.1	64	0.00
30	9	32	2.0	4.6	194	-6.1	-2.0	-10.0	66	0.00
31	7	26	3.4	5.9	205	-2.2	-0.5	-3.4	59	0.00

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds
(c) Temperature sensor's lower limit is -30C, hourly values set to -30C during colder periods

WARM SPRINGS DAILY DATA SUMMARY - OCTOBER 2009

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	6	26	2.5	4.4	259	3.7	8.1	-0.3	56
2	3	14	1.9	3.7	196	5.2	11.5	0.1	56
3	4	17	1.9	3.7	7	4.3	11.5	-1.9	65
4	2	13	2.8	3.6	350	2.1	2.8	0.5	69
5	2	13	2.3	3.5	347	0.8	5.3	-3.8	71
6	4	19	3.3	5.6	238	5.0	13.5	-3.7	53
7	6	38	2.2	3.7	345	0.6	4.9	-2.5	74
8	1	14	2.7	4.5	291	-0.8	7.1	-9.2	65
9	5	12	2.1	3.4	348	-9.3	-6.0	-13.3	68
10	4	13	1.1	2.2	349	-9.4	-3.4	-12.3	65
11	5	24	0.9	1.5	348	-10.0	-4.0	-14.4	66
12	7	23	0.8	1.4	41	-6.2	3.3	-15.8	65
13	10	27	2.0	6.0	160	4.7	13.1	-5.3	59
14	4	17	3.1	5.5	192	9.7	15.7	3.7	60
15	2	13	1.5	4.2	246	5.8	12.9	-1.5	72
16	6	24	1.1	2.4	181	6.4	18.3	-2.1	71
17	3	14	3.4	5.6	177	14.5	22.9	5.9	44
18	3	14	1.5	3.6	10	10.7	14.8	3.8	64
19	2	12	0.8	1.5	123	4.2	5.6	2.7	88
20	3	23	0.9	1.4	46	3.8	8.5	-0.4	85
21	4	21	2.1	3.4	200	5.3	11.0	-0.5	76
22	3	18	1.5	2.7	209	6.2	10.6	1.0	79
23	7	32	2.6	4.4	206	5.6	11.4	-1.3	70
24	1	16	2.8	5.1	258	5.5	8.3	1.4	62
25	2	14	1.6	3.3	203	1.5	8.7	-4.3	71
26	4	19	4.5	6.4	201	7.8	11.8	3.1	NO DATA
27	2	11	1.7	3.6	273	0.0	2.2	-3.1	NO DATA
28	5	16	1.1	1.7	353	-1.5	1.6	-6.1	NO DATA
29	6	22	1.9	3.4	216	-2.6	2.8	-8.6	NO DATA
30	3	18	2.0	5.1	247	5.0	10.5	-2.3	NO DATA
31	2	11	3.5	4.9	207	9.2	15.1	6.5	NO DATA

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

WARM SPRINGS DAILY DATA SUMMARY - NOVEMBER 2009

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	3	13	1.7	4.3	348	3.8	8.5	-3.9	NO DATA
2	5	27	1.6	3.4	183	-0.9	9.3	-7.4	NO DATA
3	7	26	1.2	2.2	28	0.4	9.5	-6.6	NO DATA
4	10	19	1.2	2.7	4	2.6	14.2	-6.5	NO DATA
5	4	18	3.4	4.9	193	10.8	18.3	4.6	NO DATA
6	6	39	3.8	6.6	239	6.4	11.0	0.6	NO DATA
7	2	17	1.7	3.6	225	1.7	8.6	-3.4	NO DATA
8	2	15	1.9	4.2	203	0.8	7.6	-6.3	NO DATA
9	2	16	2.5	4.7	171	2.0	10.1	-7.0	NO DATA
10	4	25	2.5	5.6	195	3.9	11.5	-6.4	NO DATA
11	7	17	2.1	4.2	187	1.5	6.0	-6.1	NO DATA
12	5	19	1.0	1.7	147	-4.0	-0.8	-12.3	NO DATA
13	3	14	2.5	3.9	190	-7.6	-1.4	-16.0	59
14	3	16	1.4	3.2	181	-5.9	-0.8	-13.0	68
15	1	11	2.5	3.7	193	-4.5	2.1	-12.7	56
16	2	18	4.6	6.5	159	4.1	8.6	-1.2	52
17	4	10	5.0	6.8	163	7.7	12.3	4.4	35
18	3	17	1.3	2.5	24	-1.1	4.9	-7.8	68
19	4	18	3.1	5.1	178	1.3	8.3	-7.5	53
20	3	13	4.2	7.8	155	5.9	9.7	3.6	34
21	3	36	2.9	5.3	233	-0.9	5.3	-6.0	55
22	3	22	3.2	5.1	174	-2.9	-0.2	-5.9	58
23	2	55	3.0	5.4	253	-1.2	3.2	-7.5	59
24	4	15	2.4	4.7	192	0.0	5.7	-5.3	64
25	3	24	2.1	4.2	192	1.8	10.5	-7.4	68
26	1	11	3.2	4.5	187	6.5	12.2	2.8	46
27	3	16	1.9	3.6	211	3.5	7.3	0.0	63
28	3	23	1.0	1.6	15	-2.6	3.2	-10.1	68
29	3	18	1.1	3.5	282	-0.7	6.6	-5.5	72
30	2	11	2.8	5.9	183	2.3	9.0	-6.3	55

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds

WARM SPRINGS DAILY DATA SUMMARY - DECEMBER 2009

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	(c) Average Temperature (deg C)	Maximum Temperature (deg C)	(c) Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	3	16	2.1	4.3	344	-8.1	2.0	-19.4	70
2	6	23	0.9	1.7	199	-18.8	-10.6	-25.5	70
3	6	32	1.0	1.8	206	-19.8	-12.4	-24.5	69
4	7	23	1.4	4.1	353	-12.4	-4.1	-20.7	66
5	10	32	1.8	3.0	357	-12.1	-9.5	-15.6	75
6	5	14	3.1	4.0	348	-20.2	-15.9	-24.2	59
7	6	15	0.9	1.6	160	-26.5	-19.5	-30.0	53
8	6	18	0.7	1.1	164	-27.2	-19.8	-30.0	51
9	9	27	0.8	1.9	345	-24.6	-17.4	-30.0	64
10	5	22	1.5	4.0	200	-16.1	-7.6	-27.0	57
11	3	15	3.9	5.4	189	-5.3	0.0	-8.4	37
12	3	19	2.5	4.0	196	-4.2	0.9	-8.9	60
13	4	21	1.2	1.8	2	-11.4	-8.0	-14.3	75
14	2	14	1.7	3.0	176	-5.6	-2.2	-9.9	64
15	2	12	4.8	5.6	166	0.9	3.7	-2.7	59
16	2	17	3.2	5.4	171	2.4	7.1	-3.1	67
17	2	18	1.7	3.4	210	-0.1	6.1	-7.1	75
18	4	24	1.0	1.8	213	-5.7	-2.1	-8.9	79
19	3	23	2.8	5.3	190	1.1	5.4	-5.8	68
20	1	10	3.6	4.7	177	5.6	7.9	3.7	65
21	0	5	3.2	4.1	176	4.7	8.9	0.8	60
22	4	18	1.2	1.9	0	-0.7	2.2	-2.8	74
23	1	13	1.3	2.7	11	-5.4	-2.1	-11.7	67
24	3	20	0.9	2.7	349	-11.8	-5.6	-18.7	69
25	7	39	0.7	1.2	18	-12.1	-6.6	-17.1	77
26	10	43	0.6	1.2	342	-15.0	-6.8	-19.9	74
27	10	34	0.6	1.5	353	-15.7	-5.3	-21.6	72
28	12	29	0.8	2.7	350	-14.0	-4.8	-21.0	71
29	4	15	2.2	3.7	192	-7.7	-0.2	-11.3	65
30	5	19	1.4	2.7	153	-7.2	-2.6	-11.4	69
31	0	8	3.4	4.8	183	-1.8	1.1	-4.0	58

(a) Values are at Local temperature and pressure (LTP)
(b) Calculations are weighted with corresponding wind speeds
(c) Temperature sensor's lower limit is -30C, hourly values set to -30C during colder periods

APPENDIX B

DUST SAMPLE MEMORANDA

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MEMORANDUM – Opportunity / Warm Springs Ambient Dust Sampling Events

Sampling Periods: September 18 – November 9, 2009 (Settled Dust only)
November 9, 2009 – January 1, 2010 (Settled Dust and Dustfall)

Submitted by Steve Heck, Blacktail Consulting, Inc.

February 15, 2010

This memorandum describes the preliminary results of settled dust and dustfall sampling conducted at the Opportunity and Warm Springs air monitoring sites on behalf of Kuipers and Associates, and Anaconda-Deer Lodge County. All data, discussion and conclusions provided in this report are preliminary and will undergo a complete quality assurance review prior to issuance of final results in quarterly and annual reports in accordance with the project Sampling and Analysis Plan.

1. INTRODUCTION

Since the late summer of 2008, opportunistic settled dust and dustfall sampling has been conducted at the Opportunity and Warm Springs air monitoring sites to determine the trace metal content of airborne particulate that settles on outdoor surfaces. The settled dust samples have been collected by vacuuming settled particulate onto filter cassettes from clean glass dishes; after initial sample handling issues were resolved, these sampling events proceeded smoothly, with consistent analytical results.

The dustfall sampling was more problematic, for reasons that became apparent as sampling progressed:

- Initially, the entire contents of each dustfall jar (which included a large volume of liquid) were evaporated in a 2,000 ml glass beaker. The evaporated beakers were weighed on a 0.01-g resolution balance. This approach provided poor resolution, and consequently large uncertainty in particulate mass determinations.

- During the winter of 2008-2009, high-grade isopropyl alcohol was added to the dustfall jars in the field to prevent freezing. The alcohol was found to have minimal amounts of arsenic

and zinc. However, the large amount of alcohol used for each sample (due to rapid evaporation) introduced large uncertainties into the analytical results.

Both problems were resolved over the first few sampling episodes. However, another problem developed during the late spring: flying insects such as flies, gnats and bees – and occasionally airborne plant material –became trapped in the dustfall liquid, rendering reliable particulate mass determinations impossible. This problem continued through the summer and early fall, and samples collected during those seasons were not analyzed.

The first insect-free dustfall samples were collected over the period of November 9, 2009 to January 1, 2010. The lack of insects, coupled with improvements in analytical procedures, should make the results for these samples the most reliable to date. Settled particulate samples were also collected over the same period. This sampling episode is the first in which reliable comparisons can be made between dustfall and settled dust analytical results at the Opportunity and Warm Springs sites.

This memorandum also presents the results of settled dust sampling conducted between September 18 and November 9, 2009. The dustfall samples collected during that period were not analyzed, due to the insect problem discussed previously.

2. SAMPLE COLLECTION

2.1 Settled Dust Samples

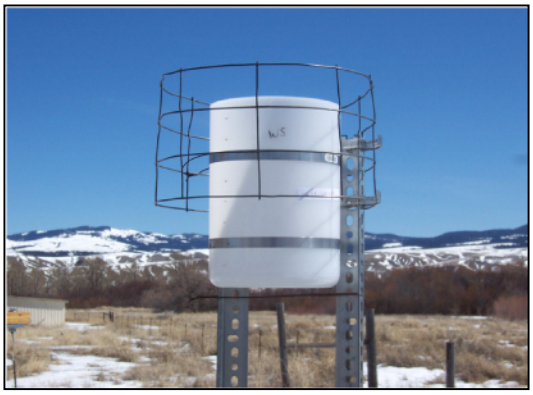
On September 18, 2009, four clean 9-inch diameter glass dishes were set out at both sites at a height of approximately 7 feet to capture and retain settling dust. A personal sampling pump supplied by SKC, Inc. was used to vacuum any settled dust from the dishes during twice-weekly site visits. Vacuuming could not be performed when standing water was present. In those instances, the water was either dumped or allowed to evaporate, and vacuuming was performed at the next opportunity.

The vacuumed dust was collected onto 37-mm diameter, matched weight mixed cellulose ester (MCE) filter cassettes. The filters were recommended by the manufacturer for applications involving trace element analyses. The matched filter weights allow one to avoid filter pre-weighing. The total dust determination is made by simply weighing the two filters following sampling; the difference in their weights equals the mass of dust collected.

The glass dishes were vacuumed for the last time on November 9, 2009, and the cassettes were submitted to the MSE Laboratory for analysis. Both samples were weighed to determine the total amount of particulate collected. Samples having a sufficient net dust mass (≥ 1.0 mg) were analyzed for arsenic, cadmium, copper, lead and zinc.

The procedure discussed above also was employed to collect a second set of settled dust samples over the period of November 9, 2009 through January 1, 2010. Additionally, a Field Standard sample was prepared by vacuuming a known standard reference material (Montana Soil 2710a) onto a clean filter cassette.

2.2 Dustfall Samples



On November 9, 2009, clean 6.75 inch diameter by 8.75 inch tall Nalgene (polypropylene) dustfall jars were installed at both sites at a height of approximately 8 feet to capture and retain settling dust. The jars were de-contaminated by the laboratory prior to use by cleaning them with laboratory soap, then rinsing them with nitric acid and deionized water. The jars were initially filled to a depth of 2 inches with deionized water (DI H_2O). The jars were inspected during twice-weekly site visits; DI H_2O was added as necessary to maintain a liquid level of at least an inch. At the end of the sampling period on January 1, 2010, the jars were covered with clean lids, and transported to the MSE laboratory for analysis. A Field Standard sample also was prepared by adding Montana Soil2710a to a clean dustfall jar partially filled with DI H_2O.

3. ANALYTICAL PROCEDURES

3.1 Settled Dust Samples

Following weighing, the filters and any particulate contents were digested using Method SW-846 3050B for soils, and analyzed for trace metals by ICP Mass Spectrometer (ICP-MS) using Method SW-846 6020A.

3.2 Dustfall Samples

After delivery to the laboratory, the dustfall jar contents were transferred into 2,000 mL beakers, which then were covered with watchglasses and evaporated in a convection oven at a temperature of 90 to 105ºC. After the liquid evaporated down to approximately 100-200 mL, the contents were transferred to pre-weighed 200-mL beakers and evaporated to dryness. The beakers then were weighed to within 0.0001 grams to determine a net particulate residue weight. The residue was digested using SW-846 Method 3050B for soils, and analyzed for trace metals by ICP Mass Spectrometer ICP-MS using Method SW-846 6020A.

4. ANALYTICAL RESULTS

Tables 1 through 3 present analytical results for the settled dust results, while Tables 4 and 5 present results for the dustfall samples. Table 6 summarizes the results, including comparisons of those obtained from the settled dust versus dustfall sampling procedures. Important findings are summarized in Section 5, and recommendations for future sampling are made in Section 6.

4.1 Settled Dust Samples

4.1.1 Filter Weights

The filters were weighed on an enclosed balance with a resolution of 0.0001 grams (0.1 mg). Results are shown in Section A of Tables 1 through 3. The "Tare" filter weight is the weight of the unexposed matched weight filter, and the "Exposed" weight is the weight of the filter dust was collected on. The net dust weight was calculated as the difference between these values.

For the Opportunity site, the mass of dust collected was 13.3 mg for the first sample and 5.6 mg for the second sample. The Warm Springs site had corresponding dust masses of 13.7 mg and 16.2 mg. The Field Standard sample had a mass of 49.8 mg. These masses were all sufficient for trace element analyses. Additionally, the net dust mass for the Cross-Contamination Blank sample (obtained by vacuuming a clean dish for several minutes) was 0.1 mg, well within the manufacturer's matched weight specification.

4.1.2 Trace Element Results

The trace element results are presented in Section B of Tables 1 through 3. The "Total" results represent the trace element concentrations in the exposed filter – which includes contributions from both the filter material and the collected dust. Cross-Contamination Blank results are shown in the column labeled "Blank." The "Net" filter trace element concentrations were calculated by subtracting the blank values from the total values, and represent the average trace element concentrations throughout the filter based solely on the contribution from the collected dust.

4.1.3 Trace Element Concentrations in Dust

The net trace element concentrations in Section B are for the entire exposed filter mass. Trace element concentrations in the collected dust were calculated using the net trace element results, the exposed filter weight and the collected dust weight. For the first sample at Opportunity, the net dust weight was 0.0133 grams, while the total weight of the exposed MCE filter was 0.0631 grams. The following example illustrates the calculation used to determine trace element concentrations in the collected dust:

- Concentration of arsenic over the entire exposed filter was 29.5 mg/kg. Therefore, the amount of arsenic present was 29.5 mg/kg x 0.0631 g, or 1.861×10^{-3} mg.
- Because all of this net arsenic concentration was contained in the dust portion, the arsenic concentration in dust was 1.861×10^{-3} mg / 0.0133 g, or 140 mg/kg.

The concentrations of other trace elements in the dust were calculated in the same manner. Results are summarized in Section C of Tables 1 through 3.

Disassembly and weighing of the filter cassettes proceeded smoothly for these samples, and no analytical issues were encountered.

4.1.4 Field QC Sample Results

Table 3 shows the results for the Field Standard sample, including the percent recoveries obtained by dividing the analytical results by the certified SRM concentrations. All recoveries were within the 80%-120% window typically specified for laboratory control standards. The results were particularly good when considering the potential uncertainties introduced by the filter material.

The Cross-Contamination Blank results were very similar to those for blank filters analyzed earlier in 2009, and indicate that residual contamination from the clean glass dishes is not an issue.

Duplicate settled dust samples were not collected for this episode, but results from the July 11 – September 18, 2009 episode showed generally good agreement with a maximum RPD of 21.9%.

4.2 Dustfall Samples

4.2.1 Trace Element Results

The raw trace element results are presented in Part A of Tables 4 and 5. They show the trace element concentrations in the liquid as received by the laboratory, the volume of liquid initially evaporated, and the net weight of solids after evaporation.

The total trace element masses in each sample were calculated by multiplying the concentrations in the sample liquid by the volume of liquid as received by the laboratory. Those results are shown in Part B of Tables 4 and 5.

4.2.2 Trace Element Concentrations in Dustfall Particulate

The trace element concentrations in the collected particulate were calculated by dividing the trace element masses by the total amount of particulate collected in each sample. Results are shown in Part C of Tables 4 and 5.

4.2.3 Field QC Sample Results

Table 5 shows the results for the Field Standard sample, including the percent recoveries obtained by dividing the analytical results by the certified SRM concentrations. All recoveries were within the 80%-120% window typically specified for laboratory control standards. The results were particularly good when considering the potential uncertainties introduced by the liquid evaporation and transferring steps associated with these analyses.

Duplicate dustfall samples were collected at the Opportunity site, and results are shown in Section C of Table 4. The duplicate RPDs were below 35% except for copper (39.3%). Trace element concentrations showed no clear trend between the reference and duplicate samples. The reference sample concentrations were higher for arsenic, cadmium and zinc, while the duplicate sample concentrations were higher for copper and lead. Given the very good Field Standard

results, it is possible that these differences reflect actual differences in the particulate matter captured by the two jars, rather than analytical or sample handling issues.

Several Field Blanks were submitted during 2009. The most recent set (shown in Part A of Table 5) indicated that residual contamination from the clean dustfall jars is not an issue. Additionally, the MSE Laboratory prepared a laboratory blank that was carried through the evaporation and analysis process. Results indicate no significant contamination.

5. SUMMARY

Table 6 summarizes the results of the sampling discussed in this memorandum. Results for the Opportunity site are shown in Part A, while Part B shows the Warm Springs results. The analyte recoveries for the Field Standard samples are shown in Part C.

5.1 Opportunity Site

Part A of Table 6 shows the two settled dust results for the Opportunity site, and compares the second settled dust result with the duplicate dustfall results over the same sampling interval. Results for the first settled dust sample were consistent with results for previous settled dust samples, with an arsenic concentration of 140 mg/kg and a lead result of 137 mg/kg. Results for the second settled dust sample were of similar magnitude, with arsenic at 99.1 mg/kg and lead at 108 mg/kg. Both sets of results were below the respective Residential Soils action levels of 250 mg/kg and 400 mg/kg.

For the second sampling event, the trace element concentrations obtained from dustfall sampling were generally similar to those obtained from the settled dust samples, with the exception of cadmium. The cadmium concentrations in the dustfall samples were roughly five times those found in the settled dust (a similar difference was found at the Warm Springs site, discussed in Section 5.2).

Selected exposed filters from the ARCO South samplers at Opportunity are analyzed for arsenic and lead concentrations, in addition to PM10. Average concentrations of arsenic and lead for the ARCO samples were calculated for the first nine months of calendar year 2009 on a total mass basis. Using only those samples with a PM10 concentration of at least 10 $\mu g/m^3$, a result of 108 mg/kg was obtained for arsenic, and 220 mg/kg for lead. Although the sampling methods and time intervals are much different, and the ARCO samplers collect only PM10 (rather than total particulate), the arsenic and lead concentrations found in the settled dust samples were qualitatively similar to those calculated for the ARCO air samples.

5.2 Warm Springs Site

Part B of Table 6 shows the two settled dust results for the Warm Springs site, and compares the second settled dust result with the dustfall analysis for the same time interval. Results for the first settled dust sample were consistent with results for previous settled dust samples, with an arsenic concentration of 78.5 mg/kg and a lead result of 83.1 mg/kg. Results for the second settled dust sample were somewhat higher, with arsenic at 131 mg/kg and lead at 109 mg/kg.

Both sets of results were below the respective Residential Soils action levels of 250 mg/kg and 400 mg/kg.

For the second sampling event, the trace element concentrations obtained from dustfall sampling were generally similar to those obtained from the settled dust samples, with the exception of cadmium. As with Opportunity, the cadmium concentrations in the dustfall samples were roughly five times those found in the settled dust.

Results for the first Warm Springs settled dust sample were somewhat lower than for the corresponding Opportunity sample, which was generally true for previous sampling periods. The second Warm Springs settled dust sample actually had somewhat higher trace element concentrations than the corresponding Opportunity sample, a departure from historical behavior. A total of 16.2 mg of dust were vacuumed from the glass dishes at Warm Springs during the second sampling event, compared with only 5.6 mg at Opportunity. This is also at odds with previous behavior, as more dust has usually been collected at the Opportunity site. However, the amount of particulate captured by the dustfall jars was similar for both sites.

It is important to note that the settled dust sampling dishes do not retain all dust that initially settles during a sampling period, since they are shallow, exposed to the wind, and dry much of the time. It is likely that much of the dust that initially settles is blown out at times – particularly the lighter dust particles. By contrast, the dustfall jars are partly filled with liquid to ensure that all dust is retained. However, they also retain unwanted material such as insects and plant matter, which is normally not a problem with settled dust dishes.

5.3 Field Standard Sample Results

Analyte recoveries for the Field Standard samples are shown in Part C of Table 6. The percent recoveries were good for both the settled dust and dustfall samples, with all results falling within the typical 80% - 120% acceptance window for laboratory control standards.

6. RECOMMENDATIONS FOR FUTURE SAMPLING

6.1 Settled Dust Sampling

The settled dust sampling is providing consistent, reliable results, and will continue to be performed in the current manner. A set of duplicate settled dust samples will be collected at the Opportunity site during the late summer of 2010, when ambient particulate levels are typically at their highest.

6.2 Dustfall Sampling

Since isopropyl alcohol is no longer being used in the dustfall jars, the sample collection cost is minimal. Therefore, dustfall samples will continue to be collected at both sites concurrent with the settled dust sampling events. Dustfall samples will be submitted for analysis only if they are free of insect and plant material that could compromise dust mass determinations.

It is believed that the presence of water in the dustfall jars may attract insects, which subsequently become trapped. For the current set of dustfall jars at Opportunity, one was prepared in the normal manner, while the second was installed with no water. Results for the two jars will be compared to determine whether the absence of water in the second jar significantly affects dust retention. Because the dustfall jars are deep (8.75 inches tall), it is questionable whether even light particles could be entrained by wind after initially settling to the bottom of the jar. If the results of this comparison are good, it may be desirable to collect dustfall samples with dry jars during the warmer months.

TABLE 1 - OPPORTUNITY / WARM SPRINGS SETTLED DUST SAMPLE RESULTS
(Sampling conducted 9-18-2009 through 11-9-2009)

A. Filter Weight Data

Opportunity Analyzed Filter Weight (g)	0.0631
Opportunity Tare Filter Weight (g)	0.0498
Opportunity Net Particulate Weight (g)	0.0133
Warm Springs Analyzed Filter Weight (g)	0.0611
Warm Springs Tare Filter Weight (g)	0.0474
Warm Springs Weight (g)	0.0137

B. Trace Element Results

	Opportunity			*Warm Springs*			*Blank* (1)
Analyte	Total Filter Conc. (mg/kg)	Net Filter Conc. (mg/kg)	Reporting Limit (mg/kg)	Total Filter Conc. (mg/kg)	Net Filter Conc. (mg/kg)	Reporting Limit (mg/kg)	Conc. (mg/kg)
As	29.5	29.5	1.21	17.6	17.6	1.49	ND
Cd	0.901	0.901	0.081	0.667	0.667	0.100	ND
Cu	112	111	1.01	73.5	72.7	1.25	0.757
Pb	29.0	28.8	0.162	18.8	18.6	0.199	0.171
Zn	149	129	2.43	108	87.6	2.99	20.4

(1) Clean dish vacuumed onto clean filter

C. Calculated Trace Element Concentrations in Particulate

	Opportunity			*Warm Springs*		
Analyte	Net Filter Conc. (mg/kg)	***Net Particulate Conc. (mg/kg)***	(1) Reporting Limit (mg/kg)	Net Filter Conc. (mg/kg)	***Net Particulate Conc. (mg/kg)***	(1) Reporting Limit (mg/kg)
As	29.5	***140***	5.74	17.6	***78.5***	6.65
Cd	0.901	***4.27***	0.384	0.667	***2.97***	0.446
Cu	111	***528***	4.79	72.7	***324***	5.57
Pb	28.8	***137***	0.769	18.6	***83.1***	0.888
Zn	129	***610***	11.5	87.6	***391***	13.3

(1) Reporting Limit adjusted to reflect mass of particulate collected

TABLE 2 - OPPORTUNITY / WARM SPRINGS SETTLED DUST SAMPLE RESULTS
(Sampling conducted 11-9-2009 through 1-1-2010)

A. Filter Weight Data

Opportunity Analyzed Filter Weight (g)	0.0544
Opportunity Tare Filter Weight (g)	0.0488
Opportunity Net Particulate Weight (g)	0.0056
Warm Springs Analyzed Filter Weight (g)	0.0634
Warm Springs Tare Filter Weight (g)	0.0472
Warm Springs Weight (g)	0.0162

B. Trace Element Results

	Opportunity			*Warm Springs*			*Blank* (1)
Analyte	Total Filter Conc. (mg/kg)	Net Filter Conc. (mg/kg)	Reporting Limit (mg/kg)	Total Filter Conc. (mg/kg)	Net Filter Conc. (mg/kg)	Reporting Limit (mg/kg)	Conc. (mg/kg)
As	10.2	10.2	1.21	33.4	33.4	1.49	ND
Cd	0.326	0.326	0.081	0.993	0.993	0.100	ND
Cu	47.2	46.4	1.01	176	175	1.25	0.757
Pb	11.3	11.1	0.162	28.0	27.8	0.199	0.171
Zn	77.3	56.9	2.43	213	193	2.99	20.4

(1) Clean dish vacuumed onto clean filter

C. Calculated Trace Element Concentrations in Particulate

	Opportunity			*Warm Springs*		
Analyte	Net Filter Conc. (mg/kg)	***Net Particulate Conc. (mg/kg)***	(1) Reporting Limit (mg/kg)	Net Filter Conc. (mg/kg)	***Net Particulate Conc. (mg/kg)***	(1) Reporting Limit (mg/kg)
As	10.2	***99.1***	11.8	33.4	***131***	5.83
Cd	0.326	***3.17***	0.787	0.993	***3.89***	0.391
Cu	46.4	***451***	9.81	175	***686***	4.89
Pb	11.1	***108***	1.57	27.8	***109***	0.779
Zn	56.9	***553***	23.6	193	***754***	11.7

(1) Reporting Limit adjusted to reflect mass of particulate collected

TABLE 3 - SETTLED DUST SAMPLE RESULTS - FIELD STANDARD

A. Filter Weight Data

Field Standard Exposed Filter Weight (g)	0.0977
Field Standard Tare Filter Weight (g)	0.0479
Field Standard Net Particulate Weight (g)	0.0498

B. Trace Element Results

	Field Standard			*Blank* (1)
Analyte	Total Filter Conc. (mg/kg)	Net Filter Conc. (mg/kg)	Reporting Limit (mg/kg)	Average Conc. (mg/kg)
As	720	720	1.51	ND
Cd	5.10	5.10	0.100	ND
Cu	1610	1609	1.26	0.757
Pb	2380	2380	0.201	0.171
Zn	1960	1940	3.01	20.4

(1) Clean dish vacuumed onto clean filter

C. Calculated Trace Element Concentrations in Particulate

	Field Standard			
Analyte	Net Filter Conc. (mg/kg)	***Net Particulate Conc. (mg/kg)***	(1) Reporting Limit (mg/kg)	***Percent Recovery of Soil Standard (2)***
As	720	***1413***	2.96	***91.7***
Cd	5.1	***10.0***	0.196	***81.3***
Cu	1609	***3157***	2.47	***92.3***
Pb	2380	***4669***	0.394	***84.6***
Zn	1940	***3805***	5.91	***91.0***

(1) Reporting Limit adjusted to reflect mass of particulate collected
(2) Montana Soil SRM 2710a

TABLE 4 -- SUMMARY OF OPPORTUNITY / WARM SPRINGS DUSTFALL RESULTS
(Samples collected from 11-9-2009 to 1-1-2010)

A. Analytical Results

Analyte	Opportunity-A (ug/L)	Opportunity-B (ug/L)	Warm Springs (ug/L)
As	0.929	1.08	0.811
Cd	0.108	0.110	0.161
Cu	2.85	5.68	4.27
Pb	0.581	0.870	0.709
Zn	6.09	6.57	7.51
Sample Volume (mL)	1561	1578	1266
Solids Weight (mg)	9.9	13.4	10.2
Solids (mg/L)	6.3	8.5	8.1
ND = Not Detected; NA = Not Applicable			

B. Trace Element Weight

Analyte	Opportunity-A Total (ug)	Opportunity-B Total (ug)	Warm Springs Total (ug)
As	1.45	1.70	1.03
Cd	0.169	0.174	0.204
Cu	4.45	8.96	5.41
Pb	0.907	1.37	0.898
Zn	9.51	10.4	9.51

C. Trace Element Concentrations in Particulate

Analyte	Opportunity-A mg/kg	Reporting Limit mg/kg	Opportunity-B mg/kg	Reporting Limit mg/kg	RPD % A vs B
As	146	7.58	127	5.60	14.1
Cd	17.0	0.505	13.0	0.373	27.2
Cu	449	6.31	669	4.66	39.3
Pb	91.6	1.01	102	0.746	11.2
Zn	960	15.2	774	11.2	21.5

Analyte	Warm Springs mg/kg	Reporting Limit mg/kg
As	101	7.35
Cd	20.0	0.490
Cu	530	6.13
Pb	88.0	0.98
Zn	932	14.7

TABLE 5 -- DUSTFALL RESULTS - FIELD STANDARD

A. Analytical Results

Analyte	Field Standard (ug/L)	Field Blank (ug/L)	Lab Blank (ug/L)
As	602	0.027	ND
Cd	4.53	0.025	ND
Cu	1300	0.199	0.060
Pb	1930	0.049	0.011
Zn	1730	1.50	0.322
	Field Standard	**Field Blank**	**Lab Blank**
Sample Volume (mL)	868	896	1000
Solids Weight (mg)	362.8	0.2	0.1
Solids (mg/L)	418.0	0.2	0.1
ND = Not Detected; NA = Not Applicable			

B. Trace Element Results (total trace element mass and mg/kg)

Analyte	Field Standard (ug)	Field Standard (mg/kg)	Reporting Limit (mg/kg)	Percent Recovery of Soil Standard (1)
As	523	**1440**	0.207	**93.5**
Cd	3.93	**10.8**	0.014	**88.1**
Cu	1128	**3110**	0.172	**90.9**
Pb	1675	**4618**	0.028	**83.7**
Zn	1502	**4139**	0.413	**99.0**
(1) Montana Soil SRM 2710a				

TABLE 6 – SUMMARY OF SETTLED DUST / DUSTFALL SAMPLING RESULTS

A. Opportunity Site *(All values mg/kg)*

Analyte	9/18/09 – 11/9/09	11/9/09 – 1/1/10		
	Settled Dust	Settled Dust	Dustfall-A	Dustfall-B
As	140	99.1	146	127
Cd	4.27	3.17	17.0	13.0
Cu	528	451	449	669
Pb	137	108	91.6	102
Zn	610	553	960	774
Dustfall Rate	N/A	N/A	0.24g/m^2/month (1)	0.33g/m^2/month (1)
(1) Based on 30-day month				

B. Warm Springs Site *(All values mg/kg)*

Analyte	9/18/09 – 11/9/09	11/9/09 – 1/1/10	
	Settled Dust	Settled Dust	Dustfall
As	78.5	131	101
Cd	2.97	3.89	20.0
Cu	324	686	530
Pb	83.1	109	88.0
Zn	391	754	932
Dustfall Rate	N/A	N/A	0.25g/m^2/month (1)
(1) Based on 30-day month			

C. Field Standard Recovery *(All values mg/kg)*

Analyte	Known SRM (1) Concentration	Settled Dust Percent Recovery	Dustfall Percent Recovery
As	1540	91.7	93.5
Cd	12.3	81.3	88.1
Cu	3420	92.3	90.9
Pb	5520	84.6	83.7
Zn	4180	91.0	99.0
(1) Montana Soil 2710a			

APPENDIX C

E-BAM PERFORMANCE CHECK / MAINTENANCE PROCEDURES FOURTH QUARTER 2009

1.1 Performance Check / Maintenance Procedures

1.1.1 E-BAM Sampler

Several checks are performed on the E-BAM sampler, including both its particulate monitoring system and the internal barometric pressure sensor.

1.1.1.1 Leak Check (E-BAM Manual Section 2.4.1.1)

Each month, the E-BAM sampler is checked for leaks in the sampling train that could compromise data integrity. This check is performed by installing a BX-302 valve/filter assembly in place of the sampling inlet, and running the sampler in its "pump test" mode while slowly closing the valve. The check is considered satisfactory if the flow drops to below 1.5 LPM.

1.1.1.2 Operating Flow Rate Check (E-BAM Manual Section 2.4.1.5)

The operating flow rate check is performed monthly by installing an NIST-traceable BGI Delta-Cal flow monitor in place of the sampling inlet, and comparing the indicated flow against the target of 16.7 LPM. The check is considered satisfactory if the indicated flow is within +/- 2% of the target value. Otherwise, the flow is adjusted at set points of 14.0 LPM and 17.5 LPM, and the operating flow re-checked.

A successful operating flow rate check, when preceded by a successful leak check, proves that the E-BAM sampler is collecting valid PM_{10} data.

1.1.1.3 Pump Test (E-BAM Manual Section 2.4.1.7)

This test was discontinued during the fourth quarter of 2009, because experience has shown it to be of little value for indicating when a pump is nearing the end of its operating life.

1.1.1.4 Zero/Span Check (E-BAM Manual Section 2.4.3.1)

Zero and span membrane plates supplied with each sampler are used quarterly to check the calibration of the E-BAM sampler's beta attenuation detector (The manual indicates this check is not required until after 6 months of operation). These plates simulate specific particulate loads when used in conjunction with a blank filter tape. The checks are performed within the E-BAM sampler's "membrane test" menu, which directs the user to install and remove the plates at specified times. At the conclusion of the test, the display screen indicates whether the calibration test was successful. The membrane plates are certified by the manufacturer.

1.1.1.5 Clean Valve and Nozzle (E-BAM Manual Section 2.4.5)

The sampler's sample inlet nozzle (located directly above the filter tape) and vane (located directly beneath the filter tape) are cleaned monthly with a modified Q-tip using isopropyl alcohol. Care is taken that no excess alcohol drips into the vane assembly, which could affect

the unit's calibration. Immediately after performing this maintenance, the leak check described in Section 1.1.1.1 is repeated to ensure that the sample train integrity was not compromised.

1.1.1.6 Clean PM_{10} Inlet (E-BAM Manual Appendix H)

Each month the PM_{10} inlet is removed from the sampler, disassembled and cleaned using paper towels and isopropyl alcohol. Additionally, all o-rings are lubricated with stopcock grease as necessary.

1.1.1.7 Barometric Pressure Sensor Check (E-BAM Manual Section 2.4.1.4)

The E-BAM's internal barometer is checked monthly using a Wallace and Tiernan aneroid barometer that is routinely checked against a mercury wall barometer. If the results agree within +/- 2 mmHg, no adjustment is necessary.

1.1.2 Meteorological Sensors

1.1.2.1 Temperature (E-BAM Manual Section 2.4.1.3)

The E-BAM manual specifies a two-point calibration procedure using an ambient temperature and an ice bath. However, the manufacturer indicated that a single-point field calibration check was generally sufficient. Disassembly of the sensor for placement in an ice bath is not trivial, and is impractical as a routine field activity.

The temperature sensor is checked monthly at ambient conditions using an Assmann Psychrometer that has been certified against an NIST-traceable mercury thermometer. If the readings agree to within 0.5 degrees Celsius, no adjustment is necessary.

1.1.2.2 Relative Humidity (Model 593 Relative Humidity Sensor Operation Manual)

The Model 593 Manual indicates that recalibration (requiring additional specialized equipment) is required only if the sensor element is replaced in the field. For this project, calibration of the relative humidity sensor will be limited to monthly collocated checks using an Assmann Psychrometer that is certified against an NIST-traceable mercury thermometer. Wet-bulb and dry-bulb temperatures, together with ambient barometric pressure, are used with psychrometric tables to calculate a true relative humidity, which is compared against the E-BAM display. If the indicated relative humidity agrees with that obtained by the Assmann psychrometer to within +/- 5% relative humidity, the results are considered acceptable. If consistently unacceptable results are obtained, the relative humidity sensor will be returned to the manufacturer for re-calibration and/or repair.

1.1.2.3 Wind Speed (Model 034B Wind Sensor Operation Manual)

The Model 034B Manual recommends an initial check of the unit's response to a known rotation rate. This is being done monthly in the field using a 300 rpm synchronous motor to produce a known wind speed of 18.49 mph (8.27 m/s). The manual specifies an accuracy of +/- 0.25 mph

(0.11 m/s) at speeds below 22.7 mph (10.1 m/s). Additionally, the response of the sensor when stopped is observed; it should be 0.3 +/- 0.1 m/s.

1.1.2.4 Wind Direction (Model 034B Wind Sensor Operation Manual)

The manual does not specify routine checks for the wind direction sensor, beyond an initial check to confirm that the sensor's readout increases from 0 to 360 degrees as the shaft is turned clockwise. However, routine checks are performed monthly to verify proper operation. First, the sensor's alignment is verified by locking the sensor in place with its alignment pin, and ensuring that a response of between 178 and 182 degrees is obtained. Next, the sensor's linearity is verified by turning it in 90-degree intervals (using the sensor crossarm as a visual reference), and confirming that the E-BAM display's direction indication changes by 90 +/- 3 degrees with each step.

The initial orientation of the sensor was performed using a solar sighting in conjunction with NIST time (WWV) to establish precise direction azimuths. The use of solar sightings – rather than magnetic compass readings – negates any localized magnetic influences.

1.1.2.5 Filter Temperature and Humidity (E-BAM Manual Sections 2.4.2.1 and 2.4.2.2)

The E-BAM Manual includes provisions for adjusting the response of both of these parameters. However, there is no practical way to accurately check either parameter with an external reference standard. Therefore, checks of these parameters will be limited to review of downloaded data files for suspicious behavior.

1.2 Performance Check Results

Each set of performance check results is presented in Appendix D. Results obtained during the fourth quarter of 2009 were satisfactory

APPENDIX D

E-BAM PERFORMANCE CHECK RESULTS

OPPORTUNITY SITE

	DATE	10/30/2009	11/30/2009	12/24/2009
	INITIALS	SH	SH	SH
	EBAM OFF-LINE@	1505 MST	1518 MST	1407 MST
	EBAM BACK ON-LINE@	1616 MST	1554 MST	1441 MST
	Reason	Monthly checks	Monthly checks	Monthly checks
	Comments	A	B	C, D
METEOROLOGICAL PARAMETERS				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	11.7	-0.1	-0.9
	Audit	12.0	-0.1	-0.8
Ambient RH Check (+/- 5% RH)	EBAM-Indicated	32%	40%	43%
	Audit (Td/Tw)	12.0 / 4.4	-0.1 / -4.3	-0.8 / -4.5
	Audit RH	30.0%	35.5%	40.5%
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped	0.3	0.3	0.3
	EBAM-Spinning	2.0	2.4	4.0
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated	8.3	8.3	8.3
	Known	8.27	8.27	8.27
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	634.3	633.2	638.4
	Audit	634	632	637
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated (with pin locked)	180	179-180	180
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm	155	154	155
	+90 degrees	245	244	243
	+180 degrees	336	334	335
	+270 degrees	68	66	64
	+360 degrees	155	156	155
EBAM SAMPLER				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	0.8 LPM	0.8 LPM	0.9 LPM
	Leak repaired?	NA	NA	NA
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.64	16.81	16.66
	As left (if recalibrated)	NA	NA	NA
Flow Calibration - Low Flow (if necessary)	As found	NA	NA	NA
	As left	NA	NA	NA
Flow Calibration - High Flow (if necessary)	As found	NA	NA	NA
	As left	NA	NA	NA
Clean Nozzle (see 2.4.5)	Confirm (X)	X	X	X
Clean PM-10 Inlet (Appdx H)	Confirm (X)	NA	NA	NA
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail	0.339 (Pass)	NA	NA
	Span Pass/Fail	0.948 (Pass)	NA	NA
Confirm Leak Check (after maintenance)	Result	0.8 LPM	0.9 LPM	1.0 LPM
	Leak repaired?	NA	NA	NA

Audit and Calibration Standards	***Wind Speed:***	300 RPM synchronous motor
	Temp / RH:	Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085
	Bar. Pressure:	W & T Model FA185260, S/N LL03297; Delta Cal S/N 498
	Wind Direction:	Initially oriented using solar sighting
	EBAM Flows etc.:	BGI Delta Cal, S/N 498

A = Temperature & humidity checked on 10-6-2009. Temperature reconfirmed with Delta Cal on 10-30-2009
B = Temperature & humidity checked on 11-21-2009. Temperature reconfirmed with Delta Cal on 11-30-2009
C = Temperature & humidity checked on 12-28-2009. Temperature also checked with Delta Cal on 12-24-2009
D = Wind speed and direction checked on 12-28-2009.

WARM SPRINGS SITE

	DATE	10/30/2009	11/30/2009	12/24/2009
	INITIALS	SH	SH	SH
	EBAM OFF-LINE@	1335 MST	1402 MST	1302 MST
	EBAM BACK ON-LINE@	1420 MST	1453 MST	1338 MST
	Reason	Monthly checks	Monthly checks	Monthly checks
	Comments	A	B	C, D
METEOROLOGICAL PARAMETERS				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	13.8	4.6	-4.7
	Audit	13.6	4.2	-4.3
Ambient RH Check (+/- 5% RH)	EBAM-Indicated	29%	55%	52%
	Audit (Td/Tw)	13.6 / 5.2	4.2 / 0.5	-4.3 / -6.8
	Audit RH	27.1%	52.2%	51.5%
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped	0.3	0.3	0.3
	EBAM-Spinning	4.4	3.6	1.9
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated	8.3	8.3	8.3
	Known	8.27	8.27	8.27
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	636.7	636.1	641.5
	Audit	636	635	640
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated (with pin locked)	178-179	178-179	178-179
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm	190	190	190
	+90 degrees	281	279	280
	+180 degrees	9	11	11
	+270 degrees	102	99	102
	+360 degrees	189	189	190
EBAM SAMPLER				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	0.5 LPM	0.5 LPM	0.5 LPM
	Leak repaired?	NA	NA	NA
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.52	16.58	16.63
	As left (if recalibrated)	NA	NA	NA
Flow Calibration - Low Flow (if necessary)	As found	NA	NA	NA
	As left	NA	NA	NA
Flow Calibration - High Flow (if necessary)	As found	NA	NA	NA
	As left	NA	NA	NA
Clean Nozzle (see 2.4.5)	Confirm (X)	X	X	X
Clean PM-10 Inlet (Appdx H)	Confirm (X)	X	X	X
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail	0.378 (Pass)	NA	NA
	Span Pass/Fail	0.961 (Pass)	NA	NA
Confirm Leak Check (after maintenance)	Result	0.5 LPM	0.5 LPM	0.5 LPM
	Leak repaired?	NA	NA	NA

Audit and Calibration Standards	***Wind Speed:***	300 RPM synchronous motor
	Temp / RH:	Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085
	Bar. Pressure:	W & T Model FA185260, S/N LL03297; Delta Cal S/N 498
	Wind Direction:	Initially oriented using solar sighting
	EBAM Flows etc.:	BGI Delta Cal, S/N 498

A = Temperature & humidity checked on 10-6-2009. Temperature reconfirmed with Delta Cal on 10-30-2009
B = Temperature & humidity checked on 11-27-2009. Temperature reconfirmed with Delta Cal on 11-30-2009
C = Temperature & humidity checked on 12-28-2009. Temperature also checked with Delta Cal on 12-24-2009
D = Wind speed and direction checked on 12-28-2009.

APPENDIX E

AIR QUALITY SYSTEM NULL DATA QUALIFIER CODES FOURTH QUARTER 2009

Opportunity Site October 2009 (All values are TSP in micrograms per cubic meter at Local temperature and pressure)

	Hour Beginning																									
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	7	5	4	7	10	22	5	9	11	17	12	15	6	16	4	13	15	8	2	8	7	3	5	11	24	9.3
2	-2	14	6	5	-5	10	12	12	13	10	-3	8	6	27	-4	0	3	3	5	5	11	-5	12	15	24	6.6
3	2	2	7	6	18	9	23	18	0	16	-2	-1	9	-1	6	13	28	45	10	15	31	26	13	18	24	13.0
4	37	7	20	25	7	10	10	2	-1	11	8	103	56	29	28	42	35	55	12	39	2	10	6	11	24	23.5
5	8	3	3	-2	0	-4	4	8	10	13	28	19	5	9	22	17	2	20	6	12	11	5	-3	2	24	8.3
6	0	1	5	10	-1	3	9	8	10	0	16	10	9	18	42	24	7	3	8	7	1	-1	7	5	24	8.4
7	9	7	10	6	5	-4	10	7	18	AM	AM	AM	AM	AM	AM	AM	-2	3	7	4	7	-5	6	7	17	5.6
8	-1	-3	-4	-2	12	12	1	25	1	-1	8	-4	1	5	12	8	3	7	2	9	1	AM	AM	AM	21	4.4
9	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	-5	4	4	-1	10	5	-5	-1	12	7	-1	2	12	2.6
10	5	-5	13	3	1	2	5	15	0	6	-1	1	6	1	4	3	-1	4	2	5	1	-3	8	10	24	3.5
11	1	6	0	10	-5	-1	14	2	5	1	3	2	11	-3	6	4	5	-2	14	-5	27	7	21	11	24	5.6
12	14	7	-5	-2	16	4	-1	19	4	7	10	7	9	5	3	11	17	3	18	20	15	4	23	9	24	9.0
13	13	0	10	-5	12	13	18	10	7	16	11	10	17	19	6	14	24	23	15	30	5	17	26	14	24	13.5
14	14	18	12	15	18	8	-1	2	-4	3	5	16	10	1	24	-5	4	6	3	-5	0	2	0	-5	24	5.9
15	18	-4	-2	3	2	-5	11	8	-5	7	4	5	36	16	30	21	2	7	1	10	11	13	10	5	24	8.5
16	5	1	10	1	2	-1	13	-3	20	-3	5	12	BA	4	5	3	17	29	11	20	11	9	9	2	23	7.9
17	13	15	6	0	3	7	4	1	5	18	10	0	6	5	10	12	3	14	13	3	9	2	6	-5	24	6.7
18	7	1	-1	4	10	1	16	21	9	6	5	15	10	3	10	7	5	1	5	7	-1	4	24	-4	24	6.9
19	18	3	2	13	10	10	-4	11	13	15	-1	2	4	-5	-2	4	2	1	-2	4	-4	6	9	-4	24	4.4
20	-5	4	-3	12	-5	-5	3	13	2	8	7	1	2	-1	5	-5	6	4	6	1	4	7	6	8	24	3.1
21	-1	-1	7	6	0	-1	5	5	12	5	5	12	3	6	7	12	3	3	6	1	20	-5	9	8	24	5.3
22	3	0	10	1	0	-5	10	-4	4	14	6	11	1	0	9	5	1	1	6	4	5	6	20	-5	24	4.3
23	7	6	9	-2	18	2	3	7	8	-3	15	11	4	5	19	11	-5	-5	9	-1	11	0	5	-5	24	5.4
24	8	0	1	13	-5	-2	-4	10	8	4	4	4	11	12	8	12	7	-3	2	6	7	3	6	2	24	4.8
25	6	-1	-5	24	2	-2	8	0	17	2	-3	5	0	14	7	2	5	3	14	8	9	0	4	1	24	5.0
26	12	5	8	17	20	12	16	12	7	22	11	32	15	23	-5	17	2	5	9	-5	-5	3	23	8	24	11.0
27	2	3	2	13	1	0	0	1	11	8	9	5	10	16	7	9	-3	8	3	-5	12	-3	3	10	24	5.1
28	-4	3	5	3	9	-1	8	9	18	19	1	3	15	-1	-5	18	16	-3	9	18	4	-5	6	7	24	6.3
29	3	15	11	0	12	17	19	15	7	-5	-3	3	6	9	6	4	7	12	1	10	41	27	0	2	24	9.1
30	16	0	7	2	17	-3	9	-5	17	19	2	3	-4	5	2	BA	BA	-5	9	-5	-5	23	-5	0	22	4.5
31	12	-5	14	5	-1	-5	9	4	-5	14	8	16	-5	2	6	0	12	5	1	2	4	5	-2	26	24	5.1
NO.	30	30	30	30	30	30	30	30	30	29	29	29	29	30	30	29	30	31	31	31	31	30	30	30		
MAX.	37	18	20	25	20	22	23	25	20	22	28	103	56	29	42	42	35	55	18	39	41	27	26	26		
AVG.	8	4	5	6	6	3	8	8	7	9	6	11	9	8	9	9	8	8	7	7	9	5	9	6		

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

Opportunity Site November 2009 (All values are TSP in micrograms per cubic meter at Local temperature and pressure)

	Hour Beginning																									
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	-5	-2	-5	19	-5	-2	12	11	6	2	22	10	-3	14	1	-1	17	6	6	3	8	-2	17	7	24	5.7
2	8	23	-5	10	6	5	14	9	8	25	56	12	10	6	14	7	2	18	5	31	-5	15	12	14	24	12.5
3	1	11	19	5	15	8	3	7	9	6	4	18	14	19	1	17	13	26	26	20	12	4	10	8	24	11.5
4	16	13	2	9	10	6	9	1	12	15	12	7	44	14	4	10	6	23	12	8	15	-4	11	11	24	11.1
5	1	7	-1	2	16	7	38	15	18	28	7	27	11	9	4	25	0	20	22	17	6	8	13	-5	24	12.3
6	13	2	14	14	24	98	76	7	12	15	-5	26	-1	2	11	8	2	2	7	-5	1	3	3	-2	24	13.6
7	14	-5	3	-5	5	4	15	-2	1	6	-2	3	1	5	1	0	4	-4	11	15	12	13	-5	23	24	4.7
8	-5	2	0	-5	10	4	10	10	0	0	0	1	-5	3	-3	2	6	38	-5	4	11	0	6	9	24	3.9
9	1	6	5	1	-3	4	7	7	5	12	4	32	16	32	48	22	32	8	0	8	6	3	9	12	24	11.5
10	-1	-5	4	4	2	4	7	17	4	13	7	18	13	12	6	2	24	14	15	17	20	6	31	19	24	10.5
11	11	9	14	-2	19	14	-5	22	8	13	21	15	-5	14	10	12	13	10	-5	19	37	10	-5	AM	23	10.8
12	-5	3	1	4	6	1	3	8	11	6	-2	22	AM	3	3	1	6	0	10	30	0	24	2	3	23	6.1
13	12	3	15	15	-5	-3	12	3	16	4	-1	13	8	12	3	BA	10	-5	1	5	-4	13	0	5	23	5.7
14	-2	3	4	3	-5	9	14	6	8	17	5	7	8	-5	1	3	9	-5	19	12	1	29	-5	15	24	6.3
15	14	-5	11	-5	27	7	-5	23	-2	-2	2	0	-4	8	3	1	3	-1	6	-1	5	4	1	-1	24	3.7
16	3	7	-5	7	-5	-1	10	-5	5	5	1	21	12	18	15	17	12	3	-4	2	1	6	3	-5	24	5.1
17	11	2	8	2	4	10	4	10	12	3	16	6	9	15	44	16	11	10	6	11	4	8	12	2	24	9.8
18	11	-2	0	8	9	4	15	-5	39	6	72	6	12	4	1	4	6	-5	10	1	6	0	13	17	24	9.7
19	-1	-1	12	-1	12	17	-5	7	16	19	34	4	13	-2	3	0	3	3	1	22	8	-1	3	-5	24	6.7
20	3	3	3	-3	3	-4	26	20	51	46	52	61	18	29	24	27	38	8	8	16	16	-3	17	49	24	21.2
21	240	47	3	31	-5	1	5	-5	10	18	30	9	3	7	0	0	3	-5	5	0	1	-2	0	-5	24	16.3
22	4	5	0	0	-2	19	-5	3	13	13	15	9	6	7	0	8	-1	-4	0	4	5	8	2	0	24	4.5
23	1	1	0	5	-2	-3	-5	5	1	4	9	-1	BA	19	1	2	6	-3	-5	27	8	20	20	9	23	5.2
24	19	2	6	6	5	6	9	5	-2	3	7	15	15	11	8	5	20	3	13	-5	7	22	-5	20	24	8.1
25	7	2	-5	6	7	-5	23	-5	19	-2	9	6	7	9	5	8	4	6	4	0	7	-4	5	0	24	4.7
26	2	3	3	0	1	13	-5	0	4	11	6	0	7	2	10	4	7	6	9	1	20	-3	7	-3	24	4.4
27	6	0	-4	2	5	-3	1	4	5	4	BA	BA	14	-1	5	4	18	9	-5	6	4	-5	2	4	22	3.4
28	-5	2	-5	14	3	-5	9	4	11	7	7	-1	9	-5	6	7	3	8	-5	17	13	12	4	2	24	4.7
29	10	17	1	-1	6	-1	-5	25	14	-5	-3	2	2	19	-5	4	1	-5	2	0	-2	2	4	1	24	3.5
30	9	-5	5	-3	27	6	-4	-5	11	14	23	5	9	18	16	BA	16	4	8	-1	8	3	2	5	23	7.4
NO.	30	30	30	30	30	30	30	30	30	30	29	29	28	30	30	28	30	30	30	30	30	30	30	29		
MAX.	240	47	19	31	27	98	76	25	51	46	72	61	44	32	48	27	38	38	26	31	37	29	31	49		
AVG.	13	5	3	5	6	7	9	7	11	10	14	12	9	10	8	8	10	6	6	9	8	6	6	7		

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

Opportunity Site December 2009 (All values are TSP in micrograms per cubic meter at Local temperature and pressure)

	Hour Beginning																									
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	6	5	-1	-5	AM	AM	AM	AM	AM	AM	4	42	2	3	5	8	13	-5	25	-5	10	-3	42	3	18	8.3
2	19	3	-1	0	14	22	2	28	6	17	-5	-3	14	13	6	6	17	-5	32	40	25	-5	13	12	24	11.3
3	8	17	11	28	3	-3	4	12	6	7	-4	-5	4	18	7	4	12	16	12	15	5	3	10	8	24	8.3
4	10	-5	29	1	17	3	4	5	-1	-2	13	21	15	16	7	5	21	-5	12	7	-5	14	-5	0	24	7.4
5	-4	24	2	39	24	32	-5	19	12	9	29	53	77	63	-1	68	15	-5	30	11	3	1	7	-5	24	20.8
6	21	6	6	25	24	9	21	51	17	20	125	368	221	152	83	11	17	13	7	17	42	26	8	27	24	54.9
7	4	2	6	34	10	AO	AO	AO	AO	AO	2	-1	5	3	0	29	2	7	18	AO	AO	AO	AO	AO	14	8.6
8	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	1	-2	2	11	19	-3	18	32	26	AO	AO	AO	AO	-4	10	10.0
9	16	22	4	22	21	13	12	9	14	1	6	-5	3	36	-5	1	22	16	1	42	28	49	7	-4	24	13.8
10	26	9	17	2	0	9	-5	18	8	4	1	3	-1	12	21	4	18	-5	-1	4	15	-5	0	-5	24	6.2
11	-2	12	7	4	4	12	22	0	-5	5	8	7	1	14	6	9	13	11	9	10	4	7	5	-4	24	6.6
12	6	3	25	-5	8	8	-1	0	8	-1	8	5	4	3	3	-1	4	-5	0	16	0	-4	15	12	24	4.6
13	-5	15	-5	13	4	8	25	-5	13	3	0	1	5	8	2	5	-2	23	-5	35	24	-5	51	2	24	8.8
14	-1	10	5	-5	0	0	-5	7	4	-3	7	1	9	12	18	5	11	7	12	4	-3	3	0	0	24	4.1
15	0	0	0	2	-1	4	3	1	0	10	9	-5	-2	0	-5	5	14	4	10	-5	3	3	4	8	24	2.6
16	2	1	4	-1	6	-2	-5	8	0	-1	4	-4	1	-4	7	-5	3	-5	-3	16	0	-5	12	-5	24	1.0
17	16	-1	-5	29	-5	-5	10	0	-5	10	-5	1	10	-5	8	-2	3	-5	16	22	-5	26	-5	14	24	4.9
18	-5	7	8	-5	-2	6	9	2	15	-5	15	11	16	10	14	4	4	13	1	17	-2	-2	4	1	24	5.7
19	1	7	-5	1	11	5	-5	10	4	8	2	6	11	9	3	7	-5	7	6	0	-5	14	1	-4	24	3.7
20	1	14	-5	4	2	7	1	-5	-5	7	-3	-3	1	3	4	4	6	1	-1	6	-5	9	-5	1	24	1.6
21	-5	-3	11	-5	-3	7	10	-3	1	2	5	2	4	0	-5	7	25	-1	3	4	-2	3	4	9	24	2.9
22	-5	7	3	-5	10	9	2	6	11	15	28	6	5	5	8	1	11	11	-1	-3	-2	5	5	-3	24	5.4
23	6	-4	-2	-2	19	5	1	-5	5	4	1	7	4	8	7	14	8	7	7	10	-5	7	1	1	24	4.3
24	1	-5	13	4	-5	1	16	57	-5	17	-5	-1	0	10	BA	11	24	-5	5	0	5	-4	8	15	23	6.8
25	25	20	16	33	-5	26	-5	14	17	7	6	3	1	5	4	2	8	3	18	20	13	34	23	19	24	12.8
26	25	-5	33	-2	22	10	11	13	23	13	4	9	5	9	7	17	18	6	17	14	37	4	54	20	24	15.2
27	23	47	-5	29	-5	20	-5	18	10	13	4	-4	-4	10	7	11	20	-3	28	25	31	-3	48	-5	24	12.9
28	12	8	18	5	1	31	-2	-4	21	14	33	3	14	18	4	10	3	1	19	6	5	0	7	3	24	9.6
29	27	0	0	12	-5	13	2	-5	14	-1	8	3	12	2	7	14	13	17	13	9	15	16	-5	4	24	7.7
30	-5	9	5	10	0	6	5	-3	14	2	10	16	2	5	17	15	32	14	32	18	-1	-5	3	12	24	8.9
31	3	3	14	0	8	0	4	5	-1	-3	15	12	14	3	3	-1	8	15	16	-1	26	-5	11	14	24	6.8
NO.	30	30	30	30	29	28	28	28	28	28	31	31	31	31	30	31	31	31	31	29	29	29	29	30		
MAX.	27	47	33	39	24	32	25	57	23	20	125	368	221	152	83	68	32	32	32	42	42	49	54	27		
AVG.	8	8	7	9	6	9	5	9	7	6	11	18	15	15	9	9	12	6	12	12	9	6	11	5		

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

Warm Springs Site October 2009 (All values are PM10 in micrograms per cubic meter at Local temperature and pressure)

	Hour Beginning																									
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	5	26	2	-5	3	16	9	5	5	11	10	-5	0	6	10	14	-1	11	6	1	6	3	3	11	24	6.3
2	14	-2	3	6	5	-4	6	10	2	10	-3	1	10	6	14	-5	3	-2	6	-4	2	2	-5	2	24	3.2
3	13	-4	15	-3	-5	5	9	0	-5	3	17	9	-2	2	5	-3	6	7	9	11	4	6	-5	13	24	4.5
4	-4	7	3	2	2	-1	2	1	-1	8	-1	6	2	4	4	6	9	1	13	-2	-2	6	-2	-4	24	2.5
5	11	-3	-2	3	2	0	1	2	3	-4	-4	2	3	10	0	-5	6	11	-4	-5	13	9	8	-5	24	2.2
6	3	4	4	4	4	-5	12	-5	10	1	10	2	10	5	4	7	1	-5	-5	1	-4	3	8	19	24	3.7
7	6	4	8	13	-4	-5	8	-5	1	38	3	15	17	12	3	10	8	-5	-3	4	-5	-2	8	6	24	5.6
8	-2	14	-5	2	-3	2	-5	8	-4	8	7	5	4	2	-5	9	-1	-5	-2	5	-4	AM	AM	AM	21	1.4
9	AM	AM	AM	AM	AM	AM	AM	AM	AM	10	11	-1	12	2	3	1	3	10	3	7	4	7	8	-5	15	5.0
10	0	1	2	5	1	-5	13	8	9	3	8	0	13	4	5	2	AM	11	-1	7	4	-1	6	7	23	4.4
11	5	9	7	4	7	-1	-5	24	-2	1	-2	2	2	1	13	-5	11	5	5	2	21	-5	4	5	24	4.5
12	-2	-1	1	12	3	4	9	-5	23	-4	16	6	3	12	2	7	1	7	16	17	6	15	6	3	24	6.5
13	11	17	6	2	27	19	10	9	4	3	23	14	6	4	7	6	5	1	11	4	10	13	4	16	24	9.7
14	4	11	11	11	12	-4	6	-4	8	-4	9	11	17	-5	5	-5	9	-2	-2	-5	-5	-5	9	4	24	3.6
15	-5	3	13	-2	-2	-1	6	-5	-1	8	10	5	7	-2	-5	0	0	7	-2	-5	9	-2	2	5	24	1.8
16	6	-5	24	-5	1	1	17	3	19	-1	6	BA	18	10	2	-1	7	-1	-4	11	-5	13	4	8	23	5.6
17	-4	4	3	8	6	0	-5	-1	14	5	11	-2	7	5	9	-1	-5	3	-1	-1	1	6	-1	0	24	2.5
18	2	-5	14	-5	4	0	10	7	-3	7	9	7	2	-1	-5	9	-4	2	3	2	-1	0	2	4	24	2.5
19	7	-1	3	8	-5	2	4	2	12	5	7	1	4	2	3	-3	5	-3	-2	2	-5	11	0	-1	24	2.4
20	3	3	2	6	-1	13	0	-5	12	6	-4	2	2	-1	8	-5	23	-2	-2	3	10	-5	7	1	24	3.2
21	-5	7	4	1	3	-2	2	-1	21	-5	0	10	8	10	14	3	10	-4	-1	-2	0	6	5	5	24	3.7
22	3	-2	7	0	7	-3	18	-5	6	11	5	-1	1	0	-3	7	-4	1	-5	-4	18	9	-5	1	24	2.6
23	3	22	-5	0	4	-5	3	12	3	-3	19	11	17	32	30	4	5	-3	6	-5	4	1	5	3	24	6.8
24	-4	-4	1	4	2	-2	-3	16	-5	8	4	7	-5	1	4	6	-5	-5	-5	5	4	-1	8	4	24	1.5
25	10	-5	3	3	2	3	-4	4	14	-5	6	0	6	1	3	-5	6	-2	-5	0	-5	14	-5	7	24	1.9
26	1	10	3	2	-5	3	9	13	-2	5	8	19	-1	16	4	1	6	-5	6	-5	-2	12	-5	6	24	4.1
27	1	-1	2	1	-3	-2	8	-5	2	0	4	-5	0	11	0	2	-5	-1	7	1	4	3	5	8	24	1.5
28	2	-1	0	14	-2	8	7	11	8	16	12	-1	8	2	10	7	4	11	-3	5	1	1	15	-5	24	5.4
29	9	3	22	-5	14	2	-1	11	5	8	8	-5	8	11	3	4	0	11	8	8	1	4	11	6	24	6.1
30	6	3	18	-5	9	6	4	-5	0	8	7	-3	8	BA	BA	7	-5	10	-1	6	0	0	-5	-5	22	2.9
31	0	3	5	-1	6	1	7	-5	10	1	2	-1	7	3	5	-5	2	0	2	-5	11	-3	7	1	24	2.2
NO.	30	30	30	30	30	30	30	30	30	31	31	30	31	30	30	31	30	31	31	31	31	30	30	30		
MAX.	14	26	24	14	27	19	18	24	23	38	23	19	18	32	30	14	23	11	16	17	21	15	15	19		
AVG.	3	4	6	3	3	2	5	3	6	5	7	4	6	6	5	2	3	2	2	2	3	4	3	4		

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

Warm Springs Site November 2009 (All values are PM10 in micrograms per cubic meter at Local temperature and pressure)

	Hour Beginning																									
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	5	7	7	2	-5	13	0	3	-5	4	6	-5	12	-5	6	0	0	-3	6	4	9	6	-5	4	24	2.8
2	3	2	17	8	-2	-4	5	-5	20	9	7	7	5	0	-3	6	-5	27	1	-5	-2	26	-3	-3	24	4.6
3	1	4	12	14	5	-1	3	2	13	-5	17	6	9	26	8	7	6	3	1	-3	4	14	11	8	24	6.9
4	6	-4	1	3	19	15	10	-3	1	14	17	10	19	18	12	17	18	7	17	5	15	-1	15	16	24	10.3
5	-5	7	3	3	3	8	4	-4	4	7	14	6	-5	18	5	9	0	0	0	6	4	2	12	-5	24	4.0
6	3	4	3	4	11	39	12	5	7	0	10	8	5	4	2	-4	4	1	6	-3	-5	5	-1	13	24	5.5
7	-5	-2	0	-2	3	-3	5	-1	6	-5	13	-5	12	-5	-1	17	-5	1	4	8	1	5	-5	6	24	1.8
8	3	2	4	0	11	5	-4	0	2	1	1	-1	-5	9	-5	2	11	-5	-5	-4	13	-5	15	7	24	2.2
9	6	0	-3	-5	16	-5	13	2	-5	-2	7	-3	1	1	6	7	-5	-2	1	3	6	-4	0	3	24	1.6
10	-3	-1	5	3	2	0	-3	7	3	2	18	10	9	3	8	4	4	-1	-1	-2	25	-5	10	4	24	4.2
11	6	4	9	15	12	-1	-5	17	9	5	10	8	11	10	7	8	4	11	-5	16	-1	7	7	5	24	7.0
12	0	12	5	15	-5	8	-1	10	6	16	-5	16	-1	3	3	5	2	4	12	-5	-1	19	-5	0	24	4.7
13	-1	12	5	2	1	-4	11	4	6	7	7	-3	9	7	-5	14	0	-3	-1	5	-5	1	5	-5	24	2.9
14	3	2	-3	1	8	-1	15	-4	5	4	0	4	7	-5	6	8	1	4	-5	2	15	-5	16	-5	24	3.0
15	7	-4	8	3	7	-5	9	11	-5	-1	4	-1	1	2	-1	3	2	-5	-1	6	1	-4	-1	-4	24	1.3
16	7	-2	3	-5	2	6	2	-2	18	11	8	1	-2	-5	6	-2	2	0	-5	-2	-1	11	-4	-1	24	1.9
17	0	6	8	0	3	3	9	-1	10	8	9	10	4	8	9	-1	2	-3	0	-1	3	2	4	-1	24	3.8
18	2	-1	7	5	-5	12	6	3	4	-5	17	-4	4	0	8	-5	-2	8	-5	4	2	-1	12	-3	24	2.6
19	3	10	13	-2	-5	-5	5	-1	12	11	9	9	-3	-3	18	5	0	-5	0	2	2	1	4	5	24	3.5
20	0	1	0	0	1	-4	5	13	8	3	2	0	8	3	3	1	-1	4	8	3	4	4	10	7	24	3.5
21	36	3	9	-4	20	-5	4	-3	3	1	4	-5	-5	11	5	0	1	3	-1	1	4	-5	-1	5	24	3.4
22	-5	4	-3	3	-5	2	-2	4	17	-3	5	13	5	1	2	-5	12	-5	-5	22	-5	5	-3	10	24	2.7
23	3	-2	-2	4	-5	0	0	-4	0	2	55	-5	-5	BA	3	-1	-1	2	0	-5	10	-5	-1	1	23	1.9
24	-3	15	4	7	10	-5	8	5	6	4	0	9	6	9	2	10	0	1	7	12	-5	11	-5	-3	24	4.4
25	5	-1	18	-5	6	11	-3	4	-5	24	7	8	-5	1	13	-5	3	-1	-1	2	-1	-4	6	3	24	3.3
26	-5	2	-2	-1	0	-4	5	-2	0	0	7	11	0	-3	9	-4	8	-3	-1	7	-3	2	3	3	24	1.2
27	6	-1	0	-4	9	-5	-4	8	0	5	-3	BA	BA	13	3	1	-5	14	-5	-1	11	-5	16	3	22	2.5
28	-2	-5	-1	-1	-5	-5	19	-5	23	-5	3	5	-3	-5	11	8	1	-2	2	9	16	-2	4	4	24	2.7
29	-3	4	11	7	7	-1	0	1	9	18	-2	-3	12	-5	-5	-5	1	17	-5	7	-3	5	-2	8	24	3.0
30	-2	3	-5	-2	-1	-4	-1	9	2	2	6	0	11	2	BA	11	1	3	4	-3	2	4	0	-4	23	1.7
NO.	30	30	30	30	30	30	30	30	30	30	30	29	29	29	29	30	30	30	30	30	30	30	30	30		
MAX.	36	15	18	15	20	39	19	17	23	24	55	16	19	26	18	17	18	27	17	22	25	26	16	16		
AVG.	2	3	4	2	4	2	4	2	6	4	8	4	4	4	5	4	2	2	1	3	4	3	4	3		

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

Warm Springs Site December 2009 (All values are PM10 in micrograms per cubic meter at Local temperature and pressure)

	Hour Beginning																									
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	6	-1	3	-5	8	1	6	6	AM	AM	16	-1	0	-2	10	2	15	-5	-5	-5	3	1	12	6	22	3.2
2	-5	10	-5	23	2	16	-5	9	-5	21	2	-1	7	5	8	17	4	7	1	9	13	2	5	3	24	6.0
3	11	-5	-5	4	23	6	10	-1	-5	4	-1	-3	0	10	3	2	8	4	10	9	-5	32	10	14	24	5.6
4	-5	11	-1	6	11	17	22	-5	11	-2	14	5	17	2	10	5	17	4	13	-5	23	13	-5	-1	24	7.4
5	23	0	17	-5	24	0	13	2	2	4	5	31	9	32	16	20	-5	5	12	11	15	1	0	10	24	10.1
6	-3	7	6	-2	4	10	5	-2	8	-5	9	4	14	6	10	6	4	6	1	9	5	-3	3	7	24	4.5
7	AV	-2	7	9	AO	AO	AO	AO	AO	AO	1	-1	6	9	7	BA	12	15	AO	AO	AO	AO	AO	AO	10	6.3
8	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	-5	-1	2	7	6	10	18	7	AO	AO	AO	AO	AO	AO	8	5.5
9	AO	AO	AO	AO	AO	AO	16	8	11	5	-2	-1	9	6	16	12	17	-5	27	1	20	14	7	-5	18	8.7
10	22	11	12	0	4	11	-5	19	-5	18	-5	-3	0	8	8	7	3	-5	0	9	-2	-3	7	-2	24	4.5
11	6	2	1	3	4	3	5	3	2	0	3	4	-5	0	15	BA	3	-2	-1	2	8	1	3	1	23	2.7
12	0	1	-1	-1	5	-2	-5	4	0	2	2	-4	6	2	7	5	9	-5	19	8	3	5	9	6	24	3.1
13	8	-3	1	5	7	18	-5	-2	9	-1	0	3	5	3	1	11	1	-5	4	4	21	2	0	5	24	3.8
14	-5	14	10	-5	-2	4	4	2	2	-5	2	2	-5	9	-2	-4	7	10	0	-1	0	-4	3	5	24	1.7
15	-5	-1	5	-2	7	4	3	0	3	12	1	0	2	3	4	6	3	2	1	-5	7	-1	1	-2	24	2.0
16	-3	-1	5	1	2	3	-2	1	4	5	3	7	-4	3	9	-5	-5	13	-5	17	-5	-5	-4	6	24	1.7
17	2	4	-2	3	-5	-2	1	-2	-1	4	6	3	7	5	-5	4	-5	2	-5	18	7	5	6	2	24	2.2
18	-3	0	3	2	-2	15	-5	-1	24	-5	2	-5	19	-3	10	9	0	2	4	8	15	-1	4	-3	24	3.7
19	3	23	-5	-2	6	-5	5	-5	7	7	-3	8	1	8	1	0	1	7	-5	-1	-5	17	-5	9	24	2.8
20	4	-4	8	-3	2	5	2	3	-5	-2	-5	3	4	-1	1	-5	10	-1	-4	6	1	1	5	-1	24	1.0
21	0	-3	1	5	-2	-1	4	-4	-1	2	0	2	0	3	0	-2	2	-5	2	3	-5	5	-5	5	24	0.3
22	10	-3	-5	17	4	-5	0	18	4	12	3	7	12	-5	16	-5	4	6	-4	11	-3	-5	6	-1	24	3.9
23	-3	3	7	3	-5	0	-5	-5	-4	5	-4	4	9	-4	11	-5	7	-5	8	13	-4	-5	-5	-3	24	0.5
24	2	-5	-1	11	4	11	-5	-5	0	20	-4	1	-5	BA	-2	11	10	1	-1	13	2	-5	17	10	23	3.5
25	3	-4	14	-5	11	22	4	-4	-5	11	17	-5	5	4	6	2	15	11	-5	25	-5	39	5	8	24	7.0
26	8	0	15	9	5	-5	12	6	-5	14	27	5	7	6	8	14	15	6	-5	43	8	-5	35	13	24	9.8
27	19	3	-4	14	20	9	11	6	-5	6	24	-5	3	7	4	15	19	2	28	11	2	25	3	34	24	10.5
28	10	5	17	9	9	16	-4	24	-5	29	26	10	10	11	23	13	21	13	6	10	9	24	-5	1	24	11.8
29	5	4	-1	0	5	-5	2	-5	7	11	8	-5	2	5	14	14	5	9	-3	15	-5	5	-1	-1	24	3.5
30	4	1	2	4	2	-2	-3	19	4	9	11	-3	11	8	6	14	13	-2	9	2	-5	7	-2	4	24	4.7
31	-4	-2	-4	5	-5	0	-1	8	1	-5	3	-5	6	1	-5	-1	2	0	-5	8	1	6	-5	2	24	0.0
NO.	28	29	29	29	28	28	29	29	28	28	31	31	31	30	31	29	31	31	29	29	29	29	29	29		
MAX.	23	23	17	23	24	22	22	24	24	29	27	31	19	32	23	20	21	15	28	43	23	39	35	34		
AVG.	4	2	3	4	5	5	3	3	2	6	5	2	5	5	7	6	7	3	3	9	4	6	4	5		

Note: Negative values and method detection limits will be addressed in the 2009 Annual Report.

Qualifier Codes and Descriptions

as of 12-APR-07

Qualifier Type	Qualifier Type Desc	Qualifier Code	Qualifier Desc
EX	Exceptional Event Qualifier	D	SANDBLASTING
		F	STRUCTURAL FIRE
		H	CHEMICAL SPILLS & INDUST. ACCIDENTS
		I	UNUSUAL TRAFFIC CONGESTION
		J	CONSTRUCTION/DEMOLITION
		K	AGRICULTURAL TILLING
		L	HIGHWAY CONSTRUCTION
		M	REROUTING OF TRAFFIC
		N	SANDING/SALTING OF STREETS
		O	INFREQUENT LARGE GATHERINGS
		P	ROOFING OPERATIONS
		Q	PRESCRIBED BURNING
		R	CLEAN UP AFTER A MAJOR DISASTER
NAT	Natural Event Qualifier	A	HIGH WINDS
		B	STRATOSPHERIC OZONE INTRUSION
		C	VOLCANIC ERUPTIONS
		E	FOREST FIRE
		G	HIGH POLLEN COUNT
		S	SEISMIC ACTIVITY
		U	SAHARA DUST
NULL	Null Data Qualifier	AA	SAMPLE PRESSURE OUT OF LIMITS
		AB	TECHNICIAN UNAVAILABLE
		AC	CONSTRUCTION/REPAIRS IN AREA
		AD	SHELTER STORM DAMAGE
		AE	SHELTER TEMPERATURE OUTSIDE LIMITS
		AF	SCHEDULED BUT NOT COLLECTED
		AG	SAMPLE TIME OUT OF LIMITS
		AH	SAMPLE FLOW RATE OUT OF LIMITS
		AI	INSUFFICIENT DATA (CANNOT CALCULATE)
		AJ	FILTER DAMAGE
		AK	FILTER LEAK
		AL	VOIDED BY OPERATOR
		AM	MISCELLANEOUS VOID
		AN	MACHINE MALFUNCTION
		AO	BAD WEATHER
		AP	VANDALISM
		AQ	COLLECTION ERROR
		AR	LAB ERROR
		AS	POOR QUALITY ASSURANCE RESULTS
		AT	CALIBRATION
		AU	MONITORING WAIVED
		AV	POWER FAILURE (POWR)
		AW	WILDLIFE DAMAGE
		AX	PRECISION CHECK (PREC)
		AY	Q C CONTROL POINTS (ZERO/SPAN)
		AZ	Q C AUDIT (AUDT)

		BA	MAINTENANCE/ROUTINE REPAIRS
		BB	UNABLE TO REACH SITE
		BC	MULTI-POINT CALIBRATION
		BD	AUTO CALIBRATION
		BE	BUILDING/SITE REPAIR
		BF	PRECISION/ZERO/SPAN
		BG	Missing ozone data not likely to exceed level of standard
		BH	Interference/co-elution
		BI	Lost or damaged in transit
		BJ	Operator Error
		BK	Site computer/data logger down
		SA	Storm Approaching
QA	Quality Assurance Qualifier	1	Deviation from a CFR/Critical Criteria Requirement
		2	Operational Deviation
		3	Field Issue
		4	Lab Issue
		5	Outlier
		6	QAPP Issue
		7	Below Lowest Calibration Level
		9	Negative value detected - zero reported
		MD	Value between MDL and IDL
		ND	No Value Detected
		SQ	Values Between SQL and MDL
		V	VALIDATED VALUE
		W	FLOW RATE AVERAGE OUT OF SPEC.
		X	FILTER TEMPERATURE DIFFERENCE OUT OF SPEC.
		Y	ELAPSED SAMPLE TIME OUT OF SPEC.

ATTACHMENT 1

LABORATORY ANALYTICAL REPORTS

Note: Non-applicable portions of laboratory reports have been excluded.

Tuesday, February 09, 2010

Analytical Laboratory

Steve Heck
Kuipers & Associates, LLC
P.O. Box 641
Butte, MT 59703

RE: DUSTFALL BUCKETS

Work Order: 1001002

Dear Steve Heck:

MSE Lab Services received 11 sample(s) on 1/4/2010 for the analyses presented in the following report.

Please find enclosed analytical results for the sample(s) received at the MSE Laboratory.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Marcee Cameron

Marcee Cameron
Laboratory Director/ Chemist
406-494-7371

Enclosure

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

E-MAILED
2/11 MC

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-001

Client Sample ID: KA-DF-OPP-016
Collection Date: 1/1/2010 3:00:00 PM
Matrix: AQUEOUS

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
SW-846 ICP-MS METALS, TOTAL			**SW6020A**	**E200.2**			Analyst: **SW**
Arsenic	0.929	0.014	0.048		µg/L	1	1/27/2010
Cadmium	0.108	0.001	0.003		µg/L	1	1/27/2010
Copper	2.85	0.013	0.040		µg/L	1	1/27/2010
Lead	0.581	0.001	0.006		µg/L	1	1/27/2010
Zinc	6.09	0.029	0.096		µg/L	1	1/27/2010
TOTAL DISSOLVED SOLIDS			**A2540C**				Analyst: **YF**
TDS	6	5	10	J	mg/L	1	1/6/2010

Review

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE-TA Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-002

Client Sample ID: KA-DF-OPP-017
Collection Date: 1/1/2010 3:00:00 PM
Matrix: AQUEOUS

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
SW-846 ICP-MS METALS, TOTAL			**SW6020A**	**E200.2**			Analyst: **SW**
Arsenic	1.08	0.014	0.048		µg/L	1	1/27/2010
Cadmium	0.110	0.001	0.003		µg/L	1	1/27/2010
Copper	5.68	0.013	0.040		µg/L	1	1/27/2010
Lead	0.870	0.001	0.006		µg/L	1	1/27/2010
Zinc	6.57	0.029	0.095		µg/L	1	1/27/2010
TOTAL DISSOLVED SOLIDS			**A2540C**				Analyst: **YF**
TDS	8	5	10	J	mg/L	1	1/6/2010

Review

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-003

Client Sample ID: KA-DF-WS-010
Collection Date: 1/1/2010 2:00:00 PM
Matrix: AQUEOUS

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
SW-846 ICP-MS METALS, TOTAL			**SW6020A**	**E200.2**			Analyst: **SW**
Arsenic	0.811	0.017	0.059		µg/L	1	1/27/2010
Cadmium	0.161	0.001	0.004		µg/L	1	1/27/2010
Copper	4.27	0.016	0.049		µg/L	1	1/27/2010
Lead	0.709	0.002	0.008		µg/L	1	1/27/2010
Zinc	7.51	0.036	0.118		µg/L	1	1/27/2010
TOTAL DISSOLVED SOLIDS			**A2540C**				Analyst: **YF**
TDS	8	5	10	J	mg/L	1	1/6/2010

Review

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-004

Client Sample ID: KA-DF-WS-011
Collection Date: 1/1/2010 2:00:00 PM
Matrix: AQUEOUS

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
SW-846 ICP-MS METALS, TOTAL			**SW6020A**	**E200.2**			Analyst: **SW**
Arsenic	602	5.01	17.3		µg/L	200	1/27/2010
Cadmium	4.53	0.030	0.115		µg/L	20	1/27/2010
Copper	1300	4.73	14.4		µg/L	200	1/27/2010
Lead	1930	0.518	2.30		µg/L	200	1/27/2010
Zinc	1730	10.5	34.6		µg/L	200	1/27/2010
TOTAL DISSOLVED SOLIDS			**A2540C**				Analyst: **YF**
TDS	418	5	10		mg/L	1	1/6/2010

Review

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-005

Client Sample ID: KA-SP-OPP-4-49064
Collection Date: 11/9/2009 4:50:00 PM
Matrix: FILTER CASSETTES

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Arsenic	29.5	0.345	1.19		mg/Kg	1	1/27/2010
Cadmium	0.901	0.021	0.079		mg/Kg	1	1/27/2010
Copper	112	0.325	0.990		mg/Kg	1	1/27/2010
Lead	29.0	0.036	0.158		mg/Kg	1	1/27/2010
Zinc	149	0.724	2.38		mg/Kg	1	1/27/2010
FILTER & SAMPLE WEIGHT - FILTER ANALYSIS			**MISC**				Analyst: **BO**
Sample/Filter Weight	0.0631	0.0001	0.0001		g	1	1/26/2010

Review

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-006

Client Sample ID: KA-SP-WS-4-49393
Collection Date: 11/9/2009 4:00:00 PM
Matrix: FILTER CASSETTES

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Arsenic	17.6	0.356	1.23		mg/Kg	1	1/27/2010
Cadmium	0.667	0.021	0.082		mg/Kg	1	1/27/2010
Copper	73.5	0.336	1.02		mg/Kg	1	1/27/2010
Lead	18.8	0.037	0.164		mg/Kg	1	1/27/2010
Zinc	108	0.748	2.45		mg/Kg	1	1/27/2010
FILTER & SAMPLE WEIGHT - FILTER ANALYSIS			**MISC**				Analyst: **BO**
Sample/Filter Weight	0.0611	0.0001	0.0001		g	1	1/26/2010

Review

Qualifiers:

E	Value above quantitation range
J	Analyte detected below the Reporting Limit
MDL	Method Detection Limit
H	Holding times for preparation or analysis exceeded
Limit	Instrument Reporting Limit
ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-007

Client Sample ID: KA-SP-OPP-4-49032
Collection Date: 1/1/2010 3:00:00 PM
Matrix: FILTER CASSETTES

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Arsenic	10.2	0.400	1.38		mg/Kg	1	1/27/2010
Cadmium	0.326	0.024	0.092		mg/Kg	1	1/27/2010
Copper	47.2	0.377	1.15		mg/Kg	1	1/27/2010
Lead	11.3	0.041	0.184		mg/Kg	1	1/27/2010
Zinc	77.3	0.840	2.76		mg/Kg	1	1/27/2010
FILTER & SAMPLE WEIGHT - FILTER ANALYSIS			**MISC**				Analyst: **BO**
Sample/Filter Weight	0.0544	0.0001	0.0001		g	1	1/26/2010

Review

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-008

Client Sample ID: KA-SP-WS-4-49269
Collection Date: 1/1/2010 2:00:00 PM
Matrix: FILTER CASSETTES

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Arsenic	33.4	0.343	1.18		mg/Kg	1	1/27/2010
Cadmium	0.993	0.021	0.079		mg/Kg	1	1/27/2010
Copper	176	0.323	0.986		mg/Kg	1	1/27/2010
Lead	28.0	0.035	0.158		mg/Kg	1	1/27/2010
Zinc	213	0.721	2.37		mg/Kg	1	1/27/2010
FILTER & SAMPLE WEIGHT - FILTER ANALYSIS			**MISC**				Analyst: **BO**
Sample/Filter Weight	0.0634	0.0001	0.0001		g	1	1/26/2010

Review

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-009

Client Sample ID: KA-SP-4-49037
Collection Date: 1/3/2010 6:00:00 PM
Matrix: FILTER CASSETTES

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Arsenic	720	2.23	7.68		mg/Kg	10	1/27/2010
Cadmium	5.10	0.134	0.512		mg/Kg	10	1/27/2010
Copper	1610	2.10	6.40		mg/Kg	10	1/27/2010
Lead	2380	0.230	1.02		mg/Kg	10	1/27/2010
Zinc	1960	4.68	15.4		mg/Kg	10	1/27/2010
FILTER & SAMPLE WEIGHT - FILTER ANALYSIS			**MISC**				Analyst: **BO**
Sample/Filter Weight	0.0977	0.0001	0.0001		g	1	1/26/2010

Review

Qualifiers:				
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-010

Client Sample ID: KA-SP-4-49111
Collection Date: 1/3/2010 6:00:00 PM
Matrix: FILTER CASSETTES

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
ICP-MS METALS, SOLID SAMPLES			**SW6020**	**SW3050B**			Analyst: **SW**
Arsenic	ND	0.461	1.59		mg/Kg	1	1/27/2010
Cadmium	ND	0.028	0.106		mg/Kg	1	1/27/2010
Copper	0.757	0.435	1.32	J	mg/Kg	1	1/27/2010
Lead	0.171	0.048	0.212	J	mg/Kg	1	1/27/2010
Zinc	20.4	0.968	3.18		mg/Kg	1	1/27/2010
FILTER & SAMPLE WEIGHT - FILTER ANALYSIS			**MISC**				Analyst: **BO**
Sample/Filter Weight	0.0472	0.0001	0.0001		g	1	1/26/2010

Review

Qualifiers:

E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Lab Services

Date: *09-Feb-10*

CLIENT: Kuipers & Associates, LLC
Lab Order: 1001002
Project: DUSTFALL BUCKETS
Lab ID: 1001002-011

Client Sample ID: WT CHM TDS BLANK
Collection Date:
Matrix: AQUEOUS

Analyses	Result	MDL	Rpt Limit	Qualifier	Units	DF	Date Analyzed
SW-846 ICP-MS METALS, TOTAL			**SW6020A**	**E200.2**			Analyst: **SW**
Arsenic	ND	0.015	0.075		µg/L	1	1/27/2010
Cadmium	ND	0.003	0.005		µg/L	1	1/27/2010
Copper	0.060	0.018	0.062	J	µg/L	1	1/27/2010
Lead	0.011	0.003	0.010		µg/L	1	1/27/2010
Zinc	0.322	0.067	0.150		µg/L	1	1/27/2010
TOTAL DISSOLVED SOLIDS			**A2540C**				Analyst: **YF**
TDS	ND	5	10		mg/L	1	1/6/2010

Review

Qualifiers:	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below the Reporting Limit	Limit	Instrument Reporting Limit
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit (MDL)

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

Date: 09-Feb-10
Report Date: 09-Feb-10

QA/QC SUMMARY REPORT

Client: Kuipers & Associates, LLC
Project: DUSTFALL BUCKETS

Work Order: 1001002
BatchID: 3001

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***3001-PB***			*Method:* ***SW6020A***		*Batch ID:* ***3001***			*Analysis Date:* ***1/27/2010***		
Arsenic	0.318	1.50	µg/L							
Cadmium	ND	0.250	µg/L							
Copper	ND	1.25	µg/L							
Lead	0.312	0.250	µg/L							
Zinc	ND	5.00	µg/L							
Sample ID: ***3001-PB-FILTERED***			*Method:* ***SW6020A***		*Batch ID:* ***3001***			*Analysis Date:* ***1/27/2010***		
Arsenic	ND	1.50	µg/L							
Cadmium	ND	0.250	µg/L							
Copper	ND	1.25	µg/L							
Lead	0.092	0.250	µg/L							
Zinc	ND	5.00	µg/L							
Sample ID: ***3001-LCS***			*Method:* ***SW6020A***		*Batch ID:* ***3001***			*Analysis Date:* ***1/27/2010***		
Arsenic	17.5	1.50	µg/L	20.00	87.6	80	120			
Cadmium	1.76	0.250	µg/L	2.000	88.1	80	120			
Copper	19.0	1.25	µg/L	20.00	95.2	80	120			
Lead	20.5	0.250	µg/L	20.00	102	80	120			
Zinc	325	5.00	µg/L	400.0	81.3	80	120			
Sample ID: ***1001002-001AMS***			*Method:* ***SW6020A***		*Batch ID:* ***3001***			*Analysis Date:* ***1/27/2010***		
Arsenic	1.50	0.048	µg/L	0.6400	89.3	70	130			
Cadmium	0.847	0.008	µg/L	0.8000	92.4	70	130			
Copper	6.67	0.040	µg/L	4.000	95.6	70	130			
Lead	0.869	0.008	µg/L	0.3200	89.9	70	130			
Zinc	13.3	0.160	µg/L	8.000	90.4	70	130			
Sample ID: ***1001002-001AMSD***			*Method:* ***SW6020A***		*Batch ID:* ***3001***			*Analysis Date:* ***1/27/2010***		
Arsenic	1.50	0.048	µg/L	0.6400	88.8	70	130	0.241	20	
Cadmium	0.870	0.008	µg/L	0.8000	95.3	70	130	2.67	20	
Copper	6.63	0.040	µg/L	4.000	94.4	70	130	0.707	20	
Lead	0.865	0.008	µg/L	0.3200	88.8	70	130	0.408	20	
Zinc	13.3	0.160	µg/L	8.000	89.7	70	130	0.438	20	

Review

Qualifiers: NA Sample conc. Is > 4*spike level S Spike Recovery outside accepted recovery limits

MSE Analytical Laboratory
P.O. Box 4078
200 Technology Way
Butte, MT 59701
Lab: 406-494-7334
Fax: 406-494-7230
labinfo@mse-ta.com

Date: 09-Feb-10
Report Date: 09-Feb-10

QA/QC SUMMARY REPORT

Client: Kuipers & Associates, LLC
Project: DUSTFALL BUCKETS
Work Order: 1001002
BatchID: 3005

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***3005-LCS***			*Method:* ***SW6020***		*Batch ID:* ***3005***		*Analysis Date:* ***1/27/2010***			
Arsenic	63.1	0.148	mg/Kg	69.63	90.7	80	120			
Cadmium	206	0.010	mg/Kg	212.0	97.2	80	120			
Copper	165	0.123	mg/Kg	175.5	94.0	80	120			
Lead	82.3	0.020	mg/Kg	83.73	98.3	80	120			
Zinc	570	0.296	mg/Kg	646.9	88.1	80	120			
Sample ID: ***1001002-005AMS***			*Method:* ***SW6020***		*Batch ID:* ***3005***		*Analysis Date:* ***1/27/2010***			
Arsenic	43.1	1.19	mg/Kg	15.85	86.0	75	125			
Cadmium	19.5	0.079	mg/Kg	19.81	93.7	75	125			
Copper	209	0.990	mg/Kg	99.05	97.7	75	125			
Lead	35.4	0.158	mg/Kg	7.924	81.7	75	125			
Zinc	318	2.38	mg/Kg	198.1	85.1	75	125			
Sample ID: ***1001002-005AMSD***			*Method:* ***SW6020***		*Batch ID:* ***3005***		*Analysis Date:* ***1/27/2010***			
Arsenic	43.1	1.19	mg/Kg	15.85	85.9	75	125	0.0381	20	
Cadmium	19.5	0.079	mg/Kg	19.81	93.7	75	125	0.0321	20	
Copper	214	0.990	mg/Kg	99.05	102	75	125	2.17	20	
Lead	35.8	0.158	mg/Kg	7.924	86.4	75	125	1.05	20	
Zinc	323	2.38	mg/Kg	198.1	87.8	75	125	1.65	20	
Sample ID: ***3005-PB-UNFILTERED***			*Method:* ***SW6020***		*Batch ID:* ***3005***		*Analysis Date:* ***1/27/2010***			
Arsenic	ND	0.150	mg/Kg							
Cadmium	ND	0.010	mg/Kg							
Copper	ND	0.125	mg/Kg							
Lead	ND	0.020	mg/Kg							
Zinc	ND	0.300	mg/Kg							
Sample ID: ***3005-PB-FILTERED***			*Method:* ***SW6020***		*Batch ID:* ***3005***		*Analysis Date:* ***1/27/2010***			
Arsenic	ND	0.150	mg/Kg							
Cadmium	ND	0.010	mg/Kg							
Copper	ND	0.125	mg/Kg							
Lead	ND	0.020	mg/Kg							
Zinc	ND	0.300	mg/Kg							

Review

Qualifiers:
NA Sample conc. Is > 4*spike level
S Spike Recovery outside accepted recovery limits

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Date: 09-Feb-10
Report Date: 09-Feb-10

QA/QC SUMMARY REPORT

Client: Kuipers & Associates, LLC
Project: DUSTFALL BUCKETS

Work Order: 1001002
BatchID: R11781

Analyte	Result	RL	Units	Spike Lvl	% Rec	Low Limit	High Limit	RPD	RPD Limit	Qualifier
Sample ID: ***LCS***			*Method:* ***A2540C***		*Batch ID:* ***R11781***		*Analysis Date:* ***1/6/2010***			
TDS	826	10	mg/L	819.0	101	80	120			
Sample ID: ***PB(1001002-011A)***			*Method:* ***A2540C***		*Batch ID:* ***R11781***		*Analysis Date:* ***1/6/2010***			
TDS	ND	10	mg/L							

Review

Qualifiers:
NA Sample conc. Is > 4*spike level
S Spike Recovery outside accepted recovery limits

FORM MSE-169
(Rev. 09/08)

MSE Technology Applications, Inc.
Laboratory Services

CHAIN OF CUSTODY

MSE WORK ORDER # 1001002

Company Name: Blacktail Consulting Inc	Project Manager: Steve Heck
Address: Po Box 4692	Project Name and Number: Kuipers tAssociates
City: Butte State: MT Zip: 59702	Email Address: sheck@rfwave.net
Phone: 498-4199	Purchase Order #:
Fax:	Sampler Name and Phone #:

ANALYSIS REQUESTED

REMARKS

Turnaround Time (TAT) / Reporting

___Standard
___Next Day*
___2nd Day*
___Other*

*All rush order requests must have prior approval

___Phone
___Mail
___Fax
___Email

SAMPLE ID	LAB ID	DATE	TIME	As, Cd, Cu, Pb, Zn	TOTAL PARTICULATE WEIGHT
KA-DF-OPP-016	001A	1-1-10	1500	X	X
KA-DF-OPP-017	002A	1-1-10	1500	X	X
KA-DF-WS-010	003A	1-1-10	1400	X	X
KA-DF-WS-011	004A	1-1-10	1400	X	X
KA-SP-OPP-4-49064	005A	11-9-09	1650	X	X
KA-SP-WS-4-49393	006A	11-9-09	1600	X	X
KA-SP-OPP-4-49032	007A	1-1-10	1500	X	X
KA-SP-WS-4-49269	008A	1-1-10	1400	X	X
KA-SP-4-49037	009A	1-3-10	1800	X	X
KA-SP-4-49111	010A	1-3-10	1800	X	X

Bill to Kuipers tAssociates

Call Steve Heck when ready to weigh cassettes

Inspection Checklist

Received Intact?	(Y)	N
Labels & Chains Agree?	Y	N
Containers Sealed?	(Y)	(N)
Cooler Sealed?	Y	(N)

Delivery Method: hld no cooler ice
Temperature (°C): 0.0°C
Preservative: ___
Date & Time: ___
Inspected By: ___

RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
Steven R Heck	1-4-10	1042	Sara Ward	1/4/10	1040
PRINTED NAME	COMPANY		PRINTED NAME	COMPANY	
Steven R. Heck	Blacktail Cons.		Sara Ward	MSETA	
RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
PRINTED NAME	COMPANY		PRINTED NAME	COMPANY	
RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
PRINTED NAME	COMPANY		PRINTED NAME	COMPANY	

MSE LABORATORY SERVICES
200 Technology Way, P.O. Box 4078
Butte, MT 59701
PH: (406) 494-7334 / FAX: (406) 494-7128
labinfo@mse-ta.com

MSE Lab Services

Sample Receipt Checklist

Client Name KUIPERS&ASSOC Date and Time Received: 1/4/2010 11:23:37 AM

Work Order Number 1001002 RcptNo: 1 Received by SW

COC_ID: CoolerID:

Checklist completed by M. Cameron 1/4/10 (Signature / Date) Reviewed by SW 1/4/10 (Initials / Date)

Matrix: Carrier name Hand-Delivered

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shippping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☑	No ☐	Not Present ☑ MC
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	
Water - VOA vials have zero headspace?	No VOA vials submitted ☑	Yes ☐	No ☐
Water - pH acceptable upon receipt?	Yes ☒	No ☐	Blank ☐

Adjusted? no Checked by YF 1-6-10

Any No and/or NA (not applicable) response must be detailed in the comments section be

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: TEMP OF AQ SAMPLES = 0.0C; DELIVERED IN BOX, NO ICE

Corrective Action _____